THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIV. No. 1382.] LONDON, NOVEMBER 5, 1889. [41ST YEAR. Price 6d.

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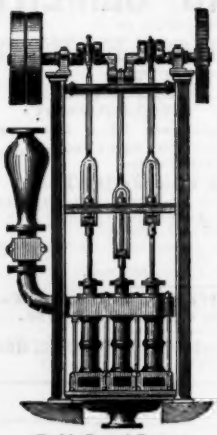

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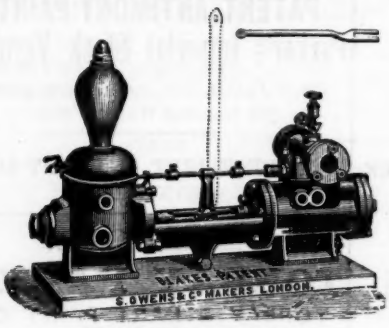

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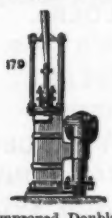

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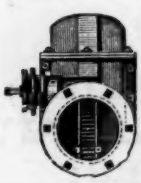

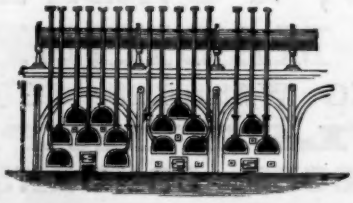

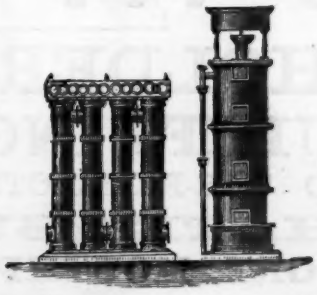

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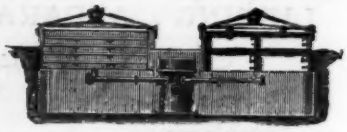

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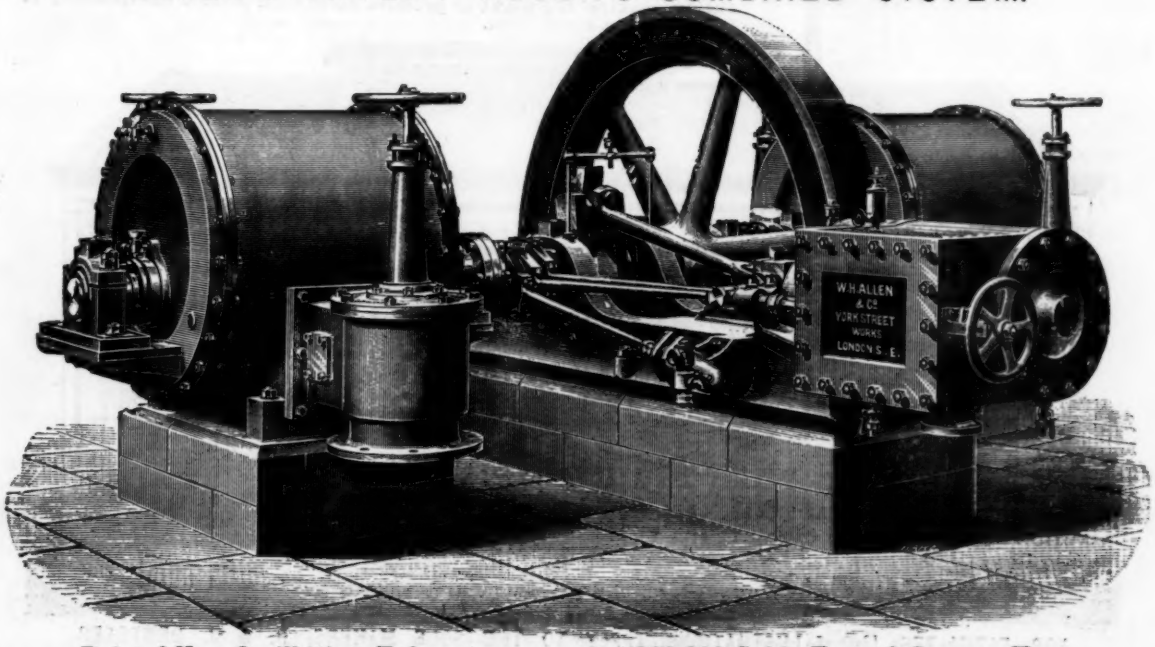

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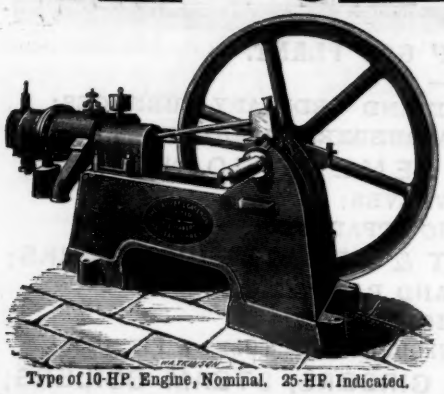

Type of 10-HP. Engine, Nominal. 25-HP. Indicated.

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Gives the Highest Satisfaction with all kinds of Work.

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Feb. 9, 1889.

GENTLEMEN,—We have been using one of your Gas-Engines on our Works for about four months, and I have pleasure in saying that it does its work in a very satisfactory manner. The engine is half-horse power, steady in all its movements, and, with ordinary care, will drive the exhaust apparatus at an even gauge.—I remain, Yours respectfully,

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SULPHATE OF AMMONIA PLANTS,

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A large quantity of liquor can be worked off in a short space of time. Very little fuel is required; and there is no loss of ammonia.

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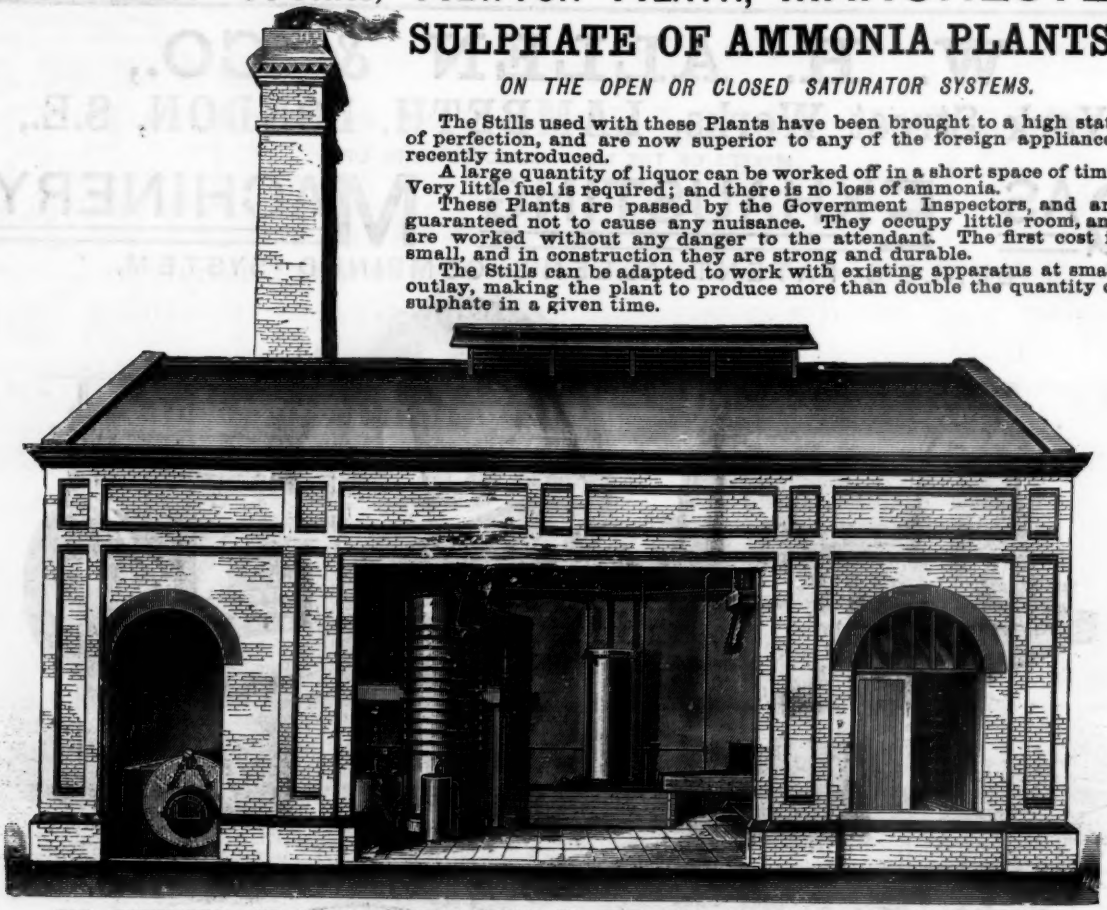

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SULPHATE OF AMMONIA.

By Her Majesty's Royal Letters Patent.

DR. FELDMANN'S APPARATUS

The most successful and approved Apparatus known up to the present time.

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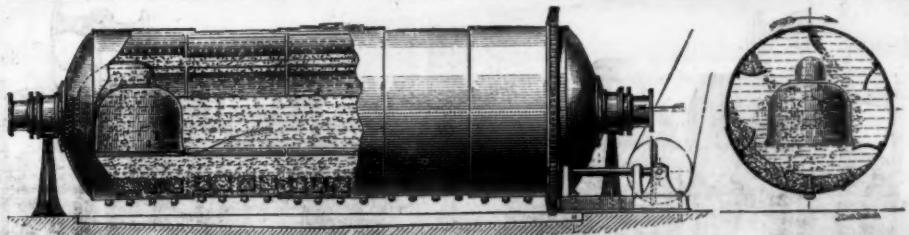
(ANDERSON'S PATENT)

For the Purification of River Water and Sewage Effluent in Large Volumes, and for Removing Colour from Water containing Peat or Clay,

BY AGITATION WITH METALLIC IRON.



MADE IN FOURTEEN SIZES; CAPABLE OF TREATING SINGLY 5000 TO 1¼ MILLION GALLONS PER DAY. REDUCES ORGANIC MATTER FROM 45 TO 90 PER CENT.; TOTALLY REMOVES MICROBES FROM POLLUTED WATER.

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OF ALL FORMS & SHAPES IN IRON OR STEEL BY SPECIAL HYDRAULIC MACHINERY.

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WALL LIGHTS, AND LUSTRES FOR GAS AND CANDLES,

TABLE GLASS OF ALL KINDS,

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(KELMAN & HENDERSON'S PATENTS)

These Apparatus are in use at the Gas-Works at Lincoln, Mountain Ash, Neath, Ellesmere (Salop), and Woodstock (Capetown); and

Two large CONDENSERS capable of dealing with **4,000,000** cubic feet of Gas per day are in course of Manufacture for the Gas-Works at Sheffield.

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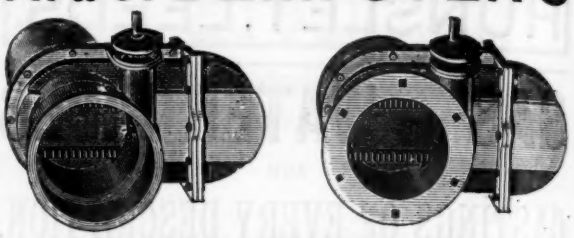

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The pinions of all our Slide Valves are now cut by special machinery from solid forgings. Valves of 10-in. bore and upwards are fitted with double racks, without extra charge. The flanges are all faced and made to standard dimensions, unless otherwise ordered. All valves are tested and guaranteed tight before leaving the works.

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NO SLIP.

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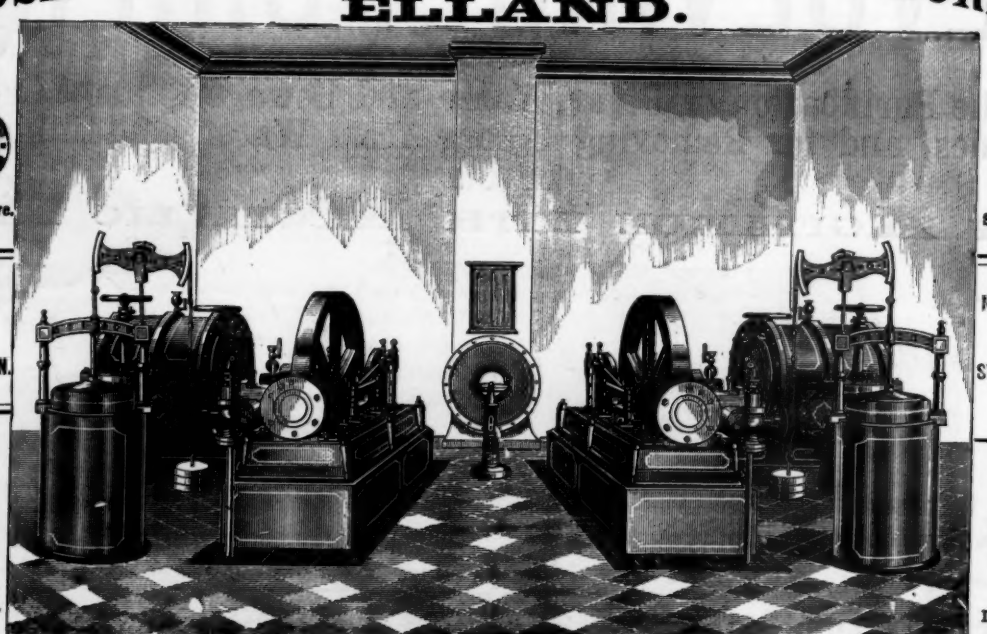

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NO HIGH SPEED.

STEADY GAUGE.

No. 6. Disc Valve.

THE ABOVE IS AN ILLUSTRATION OF A PAIR OF THE ELLAND ROTARY EXHAUSTERS ERECTED BY US AT WIGAN, EACH OF WHICH ARE CAPABLE OF PASSING 80,000 CUBIC FEET OF GAS PER HOUR.

Makers of every other description of Gas Plant, including Retorts, Retort Mountings, Condensers, Washers, Tar and Liquor Separators, Scrubbers, Purifiers, Gasholders any size, Patent Centre-Valves, Four-Way Valves, Rack, Screw, and other Valves.

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REAL OLD SILKSTONE GAS COAL.
Address, THE STRAFFORD COLLIERIES COMPANY,
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THE MOST STANDARD IS
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NO. 2.
AS USED BY
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The Hague Gas-Works.
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RELIABLE OF LIGHT IS
STANDARD LAMP.
IMPROVED TYPE.
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Manufacturers, Gas-Works Furnishers,
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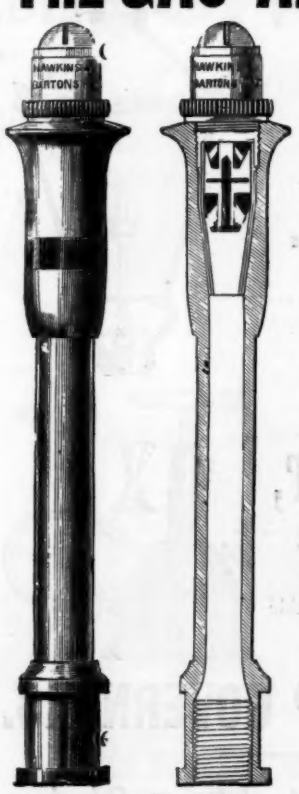
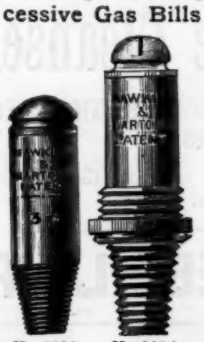
AND SPECIALTIES OF EVERY DESCRIPTION.
ALSO SOLE MANUFACTURERS OF
Hawkins & Barton's Patent Self-Regulating Lamp Governors and Burners.



Full Size, No. 1098.
These Governors are made to take to pieces for cleaning and re-adjusting.



No. 1096. No. 1094.

An enormous quantity of these Burners are in use in this Country and abroad; and they have never failed to give satisfaction. Wherever they are adopted, complaints against Bad Gas and Excessive Gas Bills naturally cease. Owing to their extreme simplicity, they cost less than half that of any others, and will last years without attention.

Trial Orders Solicited.

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REPORTS

By T. Newbigging, Esq., C.E
Feb. 25, 1889.
Burner tested, 4 feet.
Pressure, 10, 15, 20, 25 tenths.
Consumption, 4, 4, 3·95, 3·8 feet.

By G. Bower, Esq., C.E.,
St. Neots, *March* 12, 1889.
"I have tested your Pressure Regulating Burners; and I find that those you sent me do not vary more than two-tenths under pressures varying from six to forty tenths. I shall not only use them myself, but I shall recommend others to use them."

By J. Mackay, Esq., Engineer, Gas-Works, Peterhead,
July 13, 1889.
"The enclosed Burner has been in use here all last winter, and does not seem much the worse. We had seven different kinds of Governors on trial, and yours seemed to come out the best. Please send us five gross more of the same kind."

Awarded FIRST PRIZE MEDAL at the Falmouth Royal Polytechnic Exhibition, 1889.

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55 and 56, High Holborn, London,

MANUFACTURERS OF EVERY DESCRIPTION OF GAS-FITTINGS,

GAS-METERS, GAS-LAMPS, GOVERNORS, ETC.

HIGH-POWER LAMPS

OF THE MOST IMPROVED CONSTRUCTION.

STRONG COPPER TOPS.

PATENT GOVERNOR BURNERS,

Giving from 16 to 450 Candle Power.

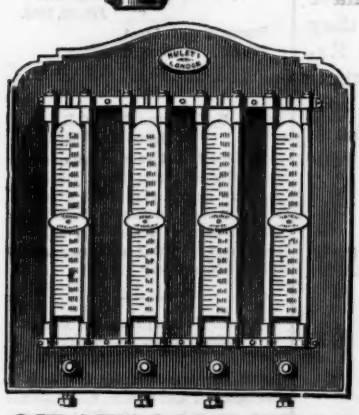
D. HULETT & Co., Limited,

Invite Gas Companies and Local Authorities to compare the Quality of these Lamps with other Makers'.

PATENT STREET LAMPS.

NO PUTTY REQUIRED.

Several thousands of these have been made, and are giving every satisfaction. New Glass can be inserted in a few minutes by any inexperienced person.



HULETT'S

Patent Service Cleanser,

FOR REMOVING OBSTRUCTIONS IN SERVICE-PIPES AND MAINS.

No Gas Company should be without this Valuable Invention.

PATENT STREET LAMP GOVERNORS.

STATION PRESSURE GAUGES, on Enamelled Iron Plates.

WROUGHT AND CAST IRON TUBES AND FITTINGS.

FIDDES & STAGG'S
IMPROVED
SERVICE CLEANSER.

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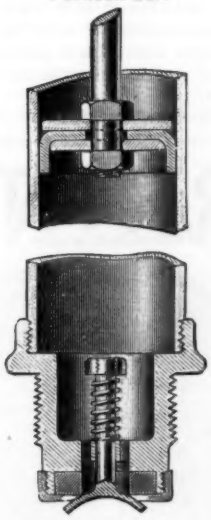

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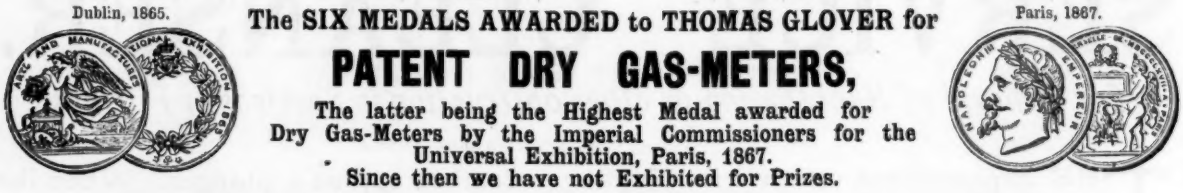

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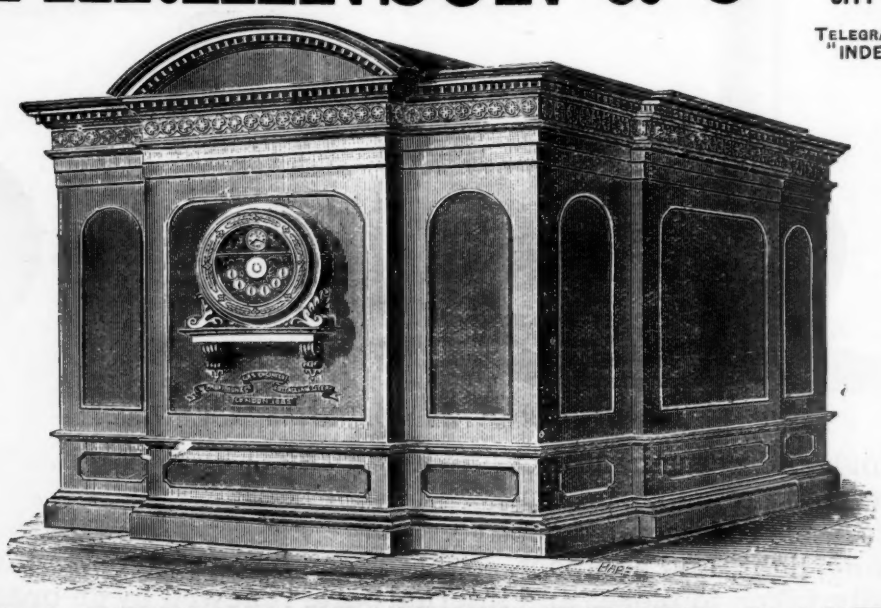

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TO ADVERTISERS.

ADVERTISEMENTS for the next number of the JOURNAL must be received by Monday, 12 o'clock noon, to ensure insertion; but as the Advertisement sheet of the JOURNAL is sent to Press the first thing on Monday Morning, Advertisers will please bear in mind that Orders for Alterations in or Stoppages of PERMANENT Advertisements should be received Not Later than Two o'clock on SATURDAYS.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, NOVEMBER 5, 1889.

THE END OF THE TRAVELLING SEASON.

THE approaching close of the Paris Exhibition will mark with special emphasis the termination of the travelling season for the present year. Though the extra attractions that have been provided this year in what is sometimes called the Capital of Pleasure have led abroad people who never before quitted the shores of their native land, and the season must therefore be called an exceptional one in this respect, yet it would not be difficult to prove that, exhibition or no exhibition, the taste for travelling is a growing one in all civilized lands. The saying that "home-keeping "youths have ever homely wits," is by no means new; nor has its truth ever been seriously disputed. What distinguishes the travelling of the present day from that of our fathers' and grandfathers' times is, however, its range and purpose. It is not only that men and women of means and leisure have expanded the limits of the "grand tour" until it embraces the world, and even then is hardly considered complete unless some of the time is spent in at least one utterly out-of-the-way corner of heathendom. The point is that people in business, whose predecessors would have regarded such adventures as pure waste of time and money, deliberately vary their usual holiday by a trip to the Cape or the States, and find their advantage in these expeditions. We in England have long been accustomed to the periodical visits of Americans, many of them evidently people with their living to get, who upon being questioned have made no secret of the fact that their object in travelling was the enlargement of their views of men and things. Year by year this influx from across the Atlantic has swelled in volume, until London shop and hotel keepers have learnt to look for their American customers as regularly as they do for the country families who make a point of coming to town for a week or two every season. This tendency of the age is a grand thing for the reunion of nations in the bond of peace. We do not mean that any amount of business or pleasure touring will eliminate race antagonisms between nationalities of different origin and speech; but in the case of England and America, it is precisely the one thing needed for both. In America especially the political separation of the two great English-speaking peoples is apt to be exaggerated. Where a nation has such a short history as that of the United States, the people are apt to magnify what history they can claim for their own; and so in the States young people have hitherto been taught a great deal more about the Revolution in which the nation was born than about the earlier time, of which the history affects them as much as it does ourselves. The Revolt of the Colonies is naturally a much bigger affair to an American citizen than it is to us, whose national history embraces so much more. Nobody can blame an American for thinking a good deal of the Fourth of July; but we fancy that it needs a visit to England to prove to a person who has been brought up in an American school how completely all this is obliterated from the average Englishman's mind.

We are all glad to see Americans over here, and believe that it does them good to come. And it is quite natural for them to wish to see Englishmen visiting as freely among themselves. Their hospitality is unbounded; and they have an earnest desire to show to appreciative guests what they have done to improve their vast heritage of land, and render it fit for habitation by civilized man. In their social and industrial circumstances also there is much that they like to display to a friendly critic. The more Englishmen see of them, the more, they honestly believe, they will admire the peculiar American talents. In our own particular industry, it is a blank summer indeed that does not bring a fairly good sprinkling of American professional visitors, to learn how gas is made and supplied under British statutory conditions, or only to make or renew personal acquaintance with leaders of gas engineering whose names are as well known on the other side of the Atlantic as they are here. Lately, moreover, indications have multiplied to show that the time has come when British gas engineers can return the compliment; and we can well understand the delight with which the representative gas managers of the States have, during the past month or two, received at their works the Chief Engineer of The Gaslight and Coke Company (Mr. G. C. Trewby), who has been going over nearly the same ground as Mr. Corbet Woodall, and in the steps of Mr. H. E. Jones, Mr. W. King, and other eminent British Gas Engineers. These voyagers of the year are home again now; and whatever other memories of their trip they may retain, that of the kindness they have everywhere met with from their colleagues beyond sea will be paramount.

It is not for us to state here what English engineers can and can not learn from a visit of inspection to the States. It is an old truism that what a traveller brings back from a journey depends chiefly upon what he takes with him. If he has the seeing eye and the receptive brain, he will return the richer for his expenditure of time and money. If these are absent, he had better have remained at home. Whatever else an English gas engineer may see in the States, however, he cannot help being struck with the leading facts of the competition between coal and water gas. How far the water gas will succeed in pushing the coal gas out of the field not long since occupied almost exclusively by the latter, it would be vain to say. If a census of coal and water gas-works is taken for the current year for the whole of the United States, the former will be found predominant in number and size; but the ratio will not be the same as it was five years ago. What is more, there has been a great deal of fusion, even where one system of manufacture has

not wholly supplanted the other. It is perfectly true that in many places the alteration has been made violently, by methods which do not tend to enhance our appreciation of the commercial rectitude of the revolutionists; but this does not explain the partiality evinced for water gas by many independent and thoroughly reliable engineers. Sooner or later the time comes—and it is not long delayed in a country where labour organizations rage unchecked—when the gas manager yields to the seduction of a process which substitutes the turning of a few cocks for all the laborious toil of the gas stoker. The cheapness of the hydrocarbon required for rendering water gas luminous is also a condition that appeals strongly to the American gas manager; and the fact that water gas leaves no residuals is a recommendation in many localities where tar and ammoniacal liquor would be difficult to dispose of if made. So the water-gas generator appears in a corner of the retort-house for occasional use in emergencies; and this is very often the beginning of the end of the coal-gas plant.

Many American gas engineers have struggled against this result; disliking, among other things, to be wholly dependent upon the hard-coal and oil dealers, and mistrustful of the effects of turning carbonic oxide upon a community accustomed to the safer coal gas. Moreover, it has been said, with what truth we do not know, that water gas charged with hydrocarbon vapours will dissolve out red and white lead joints that would remain perfectly staunch with coal gas. Again and again, however, the scale has been turned in favour of water gas by the supreme "dollars and cents" argument. The water-gas plant, called in as a stand-by at need, is worked more and more as the manager finds the cost of the gas decreasing. A very little additional impetus—such as the opening up of access to a slightly cheaper oil supply—finishes the struggle. When it remains in the subsidiary position of an auxiliary, it is because water gas is really considerably dearer than coal gas. Taking American cities all round, we believe it would be found much cheaper, on an average, to make coal gas; but the difference is not sufficient to keep water gas out of favour. American Gas Companies do not publish their accounts; and there are other considerations to outweigh the trifling advantage of a cent or two per 1000 cubic feet in the price of gas in the holder.

We shall be accused, probably, of having, in this and some other recent articles dealing with English and American methods of gas making, changed our tone with regard to water gas. If so, we should not lack exemplars in the same course; for it is idle to argue against facts, and the popularity of water gas in the States proves, without further argument, that there is something in it. Whether water gas can ever be made at a reasonable cost on this side of the water is another and totally different matter. Residuals do sell for something here, as a rule; and coke has a market probably as good as could be found for it if converted into gas. The question of the cost of carburetting would also be a serious one. Altogether, we cannot see our way very far in regard to the prospects of water gas in English gas-works. If it can be made cheaply enough, there is no law or reason against selling it. To say that water gas of 26 or 27 candle power can be sold in New York at the same rate as coal gas, does not carry one very far. We know what 16-candle gas can be sold for in London, however; and if water gas of a little higher quality can be sold here for the same price at some future time, there is nothing to show that it would not supplant coal gas on this, as it has done in places on the other side of the Atlantic. With regard to the poisonous quality of water gas, we are in the same position as ever. That its wholesale introduction into any town leads to an increase in the number of deaths traceable to gas poisoning, we have no doubt. It has been so in America, and would probably be so elsewhere. At the same time it is open to anybody to argue that the increase would be inappreciable in places where people show less propensity for blowing out the gas in their bedrooms when they retire to rest than seems to be the case in different parts of the States. It is clear, also, that water gas has been used in American towns as the means of murder and suicide, although proofs of the intention have not been easy to obtain. There is notoriously a fashion in these matters. Asphyxiation by the fumes of burning charcoal used, by all accounts, to be a favourite Parisian method of self-murder; but it never became popular in this country, possibly because English people are so habituated to something of the kind in connection with their own fogs that the idea had no charms for them. However this may be, it is not to be supposed that Londoners would change all their habits in this regard upon the introduction of water gas; and unless they did, water gas might not hurt them much more than coal gas. This is, of course, the argument we suppose to be put by a partisan of water gas. For ourselves, we do not consider the matter to be yet sufficiently within the range of practical politics to be argued about.

Another matter that gas engineering visitors to the United States must be curious about is the "running" of electric light installations in connection with gas-works. It is at least certain that the electric light has not done any harm to the gas undertakings of the great Continent; and it is rather to be argued that it has done them good. Still, with this conviction in his mind, it must be rather of a novelty for a gas engineer to find a professional brother with so many (to him) different irons in the fire. The questions of the price at which electric lighting can really be supplied and return a profit, and of the point of saturation of a community for the two methods of lighting respectively, must be interesting to study on the spot. These are the considerations which go to make American gas-works management so much more lively a business than its ordinary routine-bounded English parallel. We cannot, however, discuss these topics any more, especially as we hope to be able before long to give our readers something more definite in connection with the whole subject.

THE MEETING OF THE AMERICAN GASLIGHT ASSOCIATION.

The members of the American Gaslight Association held their seventeenth annual meeting in the middle of last month, according to rule, in Baltimore, when there was a fair, but not a large attendance. Mr. A. B. Slater, the President for the year, was in the chair; and the proceedings are reported to have been quite up to the average in point of interest. The programme contained two entries of papers bearing upon the subject of fuel gas, which is in some quarters asserted to be one of the questions of the day for the American gas engineer; but there is so far more talk than anything else about this matter. The American journals that have reached us as yet do not report the meeting fully enough for us to form any clear idea of the character of the papers and discussions; but everybody seems to have thoroughly enjoyed the visit to Baltimore, which is the main thing. Considering the extent to which they are oppressed and worried by "strikers," electricians, fuel-gas enthusiasts, unrighteous competitors generally, and other plagues, American gas managers appear to rub along in tolerable comfort, without troubling themselves overmuch on account of their enemies. If one were to say that they have a fairly "good time," taking it all round, and especially at their annual meetings, the assertion would not be unjustified. Seeing that they are all right good fellows, if we may judge from our acquaintance with as many as have made the pilgrimage to this side, we cannot envy them their enjoyment; although we certainly should like to see some better papers from them now and then. The President for the current year is Mr. Emerson M'Millin; Mr. C. J. R. Humphreys continuing at his post as Secretary and Treasurer. The next meeting is to be held very far south—at Savannah, Georgia. Having travelled north last year to Toronto, the members appear determined to avoid giving cause of offence at home by going twice in succession into Dixie. Mr. M'Millin should make a good President; and we shall look forward to his address for an interesting presentment of the condition and prospects of the gas industry in the United States.

THE HUMOUR OF THE BRISTOL GAS DIRECTORS.

The Board-room of a Gas Company is not the place to which, in a general way, one would go for manifestations of humour. Jokes do occasionally circulate round the table, no doubt, but they are usually extraneous to the business objects of a directors' meeting, and are retained for private use. To prepare a huge joke, consciously or otherwise, in the disguise of an item submitted in the *agenda*, circulated in public, and entered on the minutes, is an achievement reserved for the Directors of the Bristol Gas Company, who, if the report that has reached us is true, must henceforward be regarded as humorists of the first order. Having perpetrated the biggest *fiasco* in the way of a "lock-out" ever heard of in the history of the gas industry, having outraged local feeling, upset labour relations all over the district, and estranged both capitalists and workmen, these gentlemen meet in solemn conclave, and pass a vote of thanks to their Secretary and Engineers, and the other officers of the Company, for the willing and able (?) manner in which they discharged their duties during the late strike! Seeing that, as we have already shown, the "Engineers and other officers

"of the Company" had no responsibility for the strike, which for them meant nothing but anxiety and hard work, this vote of the Directors can only be intended to excuse themselves and the Secretary. Comment fails before such an astounding illustration of the quality of the Bristol gas direction. It is impossible to argue over a joke, which can only be felt. In the amusing burlesque of *Faust up to Date*, the soldier who claimed to have been first off the field obtained a medal. If the piece is ever performed in Bristol, the stage manager will be able to vary the "book" with a local parallel that may be depended upon to "bring down the house."

THE CALL ON WATER GAS SHARES.

The announcement that the British Water Gas Syndicate mean to call up the balance of their capital is one more incident in the drama that is being played out between the Syndicate and the two subsidiary Companies that were launched in the first flush of the water gas fever. The excuse offered by the Directors for wanting this additional money is that the cash which they expected from the concessionary concerns for the patent rights over their respective districts has not been forthcoming. The North British Company have obtained a year's grace for the payment of their portion; but the Nottingham and Derbyshire Company are reluctant to pay anything; and the Syndicate have accordingly commenced an action for "specific performance" against their unnatural offspring. This action will, of course, raise the whole question of the value of the patents held by the Syndicate; and although the Directors profess to be quite confident as to the result of the litigation, they evidently think it prudent to get in all the money they can before the difficulty grows worse. It is stated in the circular accompanying the call-note that further capital is needed because of the want of this purchase-money owed by the subsidiary Companies; but the shareholders may naturally ask what has become of the money already paid up? Have the Directors parted with all their cash to Mr. Samson Fox and his fellow-patentees, and this on the very eve of an action which raises the whole principle on which the speculation is founded? The affair does not look at all pleasant for the unfortunates who have been left with water gas shares. The Syndicate have done nothing by way of justifying their promises when the capital was offered for subscription. It would be only reasonable if the Directors were called to account before they are entrusted with any more money.

The Awards at the Birmingham Electrical Exhibition.—In the list of awards at the Birmingham Electrical Exhibition which appeared in the Journal last week, there should have been included a special gold medal—the highest award given—for the "Otto" gas-engine, shown by Messrs. Wright, the representatives of Messrs. Crossley Bros., Limited.

The Gas Industry in Spain.—The Madrid Correspondent of *Industries*, referring to the willingness of the English Company who own the gas-works at Denia and at Jativa to take up other works in towns where there are prospects of increasing local importance, says the Utrera works, amongst others, have been offered to them; but the representatives of the Company do not seem decided to take them. There are, he states, still many large places in Andalusia in which, judging from the number of the inhabitants, gas-works ought to succeed; but they are essentially agricultural places, in which the comforts of modern life have very little chance to be introduced for the present. The same authority has been informed that the Dinsmore process is to be tried in some of the gas-works in Spain; but he doubts if it will turn out commercially successful, from the fact that, in general, gas costs very little, owing to the comparatively great value of coke. At Bilbao, the cost is about 1s. 1d. per 1000 cubic feet delivered at the customers' houses.

Junior Engineering Society.—We have received a copy of the report of the proceedings of this Society during the past session (the eighth), which closed on the 30th Sept., and of the programme of arrangements for the current year. The President who has just gone out of office was Professor Unwin, F.R.S., whose address dealt with the value of theory in an engineer's work. His successor is Professor Perry, F.R.S., who opened the new session on the 11th ult. with an appropriate discourse on "Mechanical Engineering in Electrical Industries." At the meetings of the Society last year, eight useful papers were read; and the members paid a number of visits to engineering and other works of interest. The papers for the present session are all on well-chosen subjects, the discussion of which cannot fail to add to the knowledge of the members. As before, arrangements will be made for excursion visits. The Society commends itself to the notice of the younger members of the engineering profession. The meetings are held in the Westminster Palace Hotel on Friday evenings; and the excursions generally take place on Saturday afternoons. The Honorary Secretary and Treasurer is Mr. Walter T. Dunn, 64, Reedworth Street, Kennington Road, S.E.

Water and Sanitary Affairs.

An article by Captain Shaw, on "Some Great Fires," in the current number of *Murray's Magazine*, brings into notice the marked improvement which time and science have effected in the methods of extinguishing conflagrations. At the period of the Great Fire of London, in 1666, the only "engines" in use were syringes of an extremely primitive type. These were filled by dipping the end of the pipe into water, and drawing the piston up; and the water was forced out by the fireman applying the end of the rod against his chest, and pulling down the cylinder. Later on, so-called "water-engines" were introduced, capable of being worked only from the top, but provided with a universal joint, by means of which the water could be sent in any direction. To this invention succeeded that of the hose or flexible pipe, which, for the first time, enabled firemen to convey water into the interior of a burning building. The "father" of the last-named invention was an ingenious Dutchman, who wrote an elaborate treatise mainly for the purposes of an advertisement. Speaking of the year 1888, Captain Shaw mentions that the quantity of water used for the purposes of fire extinction was just 9 million gallons, or a little more than 40 thousand tons. It is certainly remarkable to notice that on the occasion of the Wood Street fire (Dec. 8, 1882), the quantity of water discharged was 6,700,000 gallons, or about 30,000 tons, so that the aggregate quantity of water used last year in fire extinction compares very favourably with the consumption for similar purposes in the year of that disastrous conflagration, upon which Captain Shaw dwells at considerable length. Another fire of exceptional proportions to which the writer of the article directs attention is that which occurred in Paternoster Row on April 2, 1884, when the quantity of water discharged was 563,000 gallons, or upwards of 2500 tons. These are the most conspicuous examples of great fires to which Captain Shaw devotes his article, so far as London is concerned; but of course, serious as were the outbreaks in question, they are not to be compared with the stupendous conflagration which devastated Chicago in October, 1871. And yet Chicago was regarded as one of the most substantially-built modern cities in the world, and, in fact, commanded admiration by reason of its solid and well-constructed stores and dwellings. Moreover, in 1867, gigantic waterworks were built in order to meet the requirements of the inhabitants; and there were said to be available each day 114 million gallons of water distributed through mains to various parts of the city. The cost of these great works was about £500,000. Not only was there this magnificent supply of water, but there was in force a Building Act, which, in stringent terms, required the removal of the wooden structures of the older city. As a matter of fact, however, indifference or corruption on the part of the municipal authorities had prevented this Act from being put in full operation; and there can be no doubt that the ancient wooden structures which had been allowed to remain in the spaces between the new buildings contributed very largely to the disastrous losses which resulted from the fire. The value of property in Chicago on the day before the conflagration was estimated at £124,000,000, and the loss occasioned was nearly 47 per cent. of the entire value. There are many interesting features in Captain Shaw's article, and not a few wise suggestions as to the need of insisting on a due regard to precautionary building laws; for, as the writer points out, the safety of a city depends not only on having a good water supply and a well-trained fire brigade, but also, and perhaps to a greater extent, on the mode in which the buildings are constructed, and the property within them classified and stored. By way of reminder, a word may be added to what Captain Shaw has recorded—namely, that the enormous quantity of water provided by the Metropolitan Companies for the purpose of extinguishing fire is furnished free of cost alike to ratepayers and private individuals.

Mr. Ebenezer Botting must now be convinced that he was ill-advised in his proceedings against the Chelsea Water-Works Company, reported in last week's issue of the Journal. It will be remembered that the supply of water to three houses in Brompton Road was conveyed in one pipe from the main, and, therefore, through the rate in respect of one house not being paid, the supply was cut off both from that house and from the premises adjoining. Thereupon complainant summoned the Company before Mr. Sheil, at the Westminster Police Court. Mr. Sheil was of opinion that there ought to be

separate communication-pipes—and with this, as an abstract opinion, we are fully disposed to agree; but as the representative of the Company pointed out, in the case of old houses like complainant's, it is impossible for the officers of a Water Company to be aware of the actual condition of things until the ground has been opened. As between the complainant and the Chelsea Company, it was, of course, necessary to deal with the summons in its strictly legal aspect; and, after a very short argument, it became apparent that the complainant had sought to make use of the Water Companies' (Regulation of Powers) Act, 1887, in circumstances to which that measure could have no possible application. The Magistrate pointed out that the Act only applied where the owner, and not the occupier, was liable for the rate. This was not the case with respect to the summons before the Court; and, therefore, there was no ground on which a penalty could be imposed. The complainant's Solicitor being quite unable to show under what other Act the proceedings could be justified, the summons was dismissed; and the impetuous Mr. Botting has had to pay one guinea costs, by way of penalty for rashly entering upon proceedings for which in law there was no foundation.

THE DANGER OF PETROLEUM VAPOURS.—It is stated that crude or insufficiently purified petroleum produces, with ordinary temperature, hydrocarburetted vapours, which, spreading and mingling with the confined air in warehouses and other ill-ventilated places, forms a more or less inflammable and explosive mixture, which is a source of very serious danger. A number of experiments have recently been made to determine in what proportions a mixture of air and petroleum vapour is explosive; and the following are the results obtained:—With 5 per cent. of vapour, there is no danger of explosion; with 6·25 per cent., a very feeble report; with 8·30 per cent., a loud report; with 11 to 14 per cent., a violent report; with 20 per cent., no explosion. Up to now, no practical means have been known for proving whether or not air mixed with the vapour of petroleum is dangerous; and a special apparatus for this purpose has to be invented.

THE USE OF GAS FOR CULINARY PURPOSES IN FRANCE.—Although the price charged for gas in France is in most cases twice, and in many instances three times as high as it is in England—ranging, in fact, from 5s. to 10s. per 1000 cubic feet—it is largely used for cooking purposes; and we learn, from a correspondent who has recently had exceptionally favourable opportunities for forming an opinion on the subject, that it would be still more extensively employed if the appliances available to the consumers were more economical in their operation. It appears that the stoves of English makers are not very much known in France. During the course of the past six weeks there has been a great stir among the French companies with the view of extending the consumption of gas for cooking purposes. In that period, attractive lectures on cookery have been delivered in about twenty towns, and been well attended; and arrangements are now completed for similar lectures in seven others before the middle of the present month. According to a Bordeaux paper which has just reached us, the Gas Company in that city opened their new offices on the 15th ult. with a brilliant reception, at which the Mayor was present, and a special feature of which was a lecture on cookery by Madame Alting-Mees, who has been invited to visit Bordeaux next month and found a school of cookery. This lady is now bringing to a close a most successful tour in France, in order to commence, on the 18th inst., a course of lectures in the Metropolis, at the special request of The Gaslight and Coke Company.

AMERICAN GASLIGHT ASSOCIATION.—The last number of the *American Gaslight Journal* to hand contains a brief account of the proceedings at the seventeenth annual meeting of this Association, which was held on the 16th, 17th, and 18th ult., at Baltimore. There was a good attendance on the first day, though it was not so large as was expected. On the second day, however, it was greatly augmented; nearly every State in the Union being represented. The President (Mr. A. B. Slater, of Providence, R.I.) delivered an interesting address; and the papers, the titles of which have already been given, were well received. The Association adopt the excellent plan of printing the papers in advance; and, by the kindness of an esteemed correspondent, copies have been forwarded to us. We reproduce elsewhere two of them—one on "The Operation and Care of Gasholders," by Mr. C. L. Rowland, of the Continental Iron-Works, Brooklyn; the other on "The Conduct of an Electric Light Business in Connection with the Gas Industry," by Mr. W. H. Pearson, of Toronto—and the others will be given, fully or in abstract, with the principal points in the discussions thereon, in subsequent issues of the JOURNAL. Unfortunately, the energetic Secretary of the Association (Mr. C. J. Russell Humphreys) was unable, owing to an attack of illness, to occupy his accustomed place on the first day; on the second day, however, he was in his old position—doubtless to the gratification of all present. The following are the office-bearers for the current year:—President, Mr. Emerson M'Millin; Vice-Presidents, Mr. J. B. Harbison, Mr. W. H. White, and Mr. A. E. Boardman; Secretary and Treasurer, Mr. C. J. R. Humphreys. The next meeting is to be held at Savannah (Ga.).

Essays, Commentaries, and Reviews.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(FOR STOCK AND SHARE LIST, see p. 887.)

PRICES in the Stock Markets have had a better time of it, on the whole, during the past week than in the one preceding. Still they have not been free from irregularities; and the amount of business has been kept down by the closing of the house on Friday (the 1st inst.), and a limited attendance next day. The position of the Money Market remains about the same. In the Gas department the course of affairs has been interesting and, we sincerely hope, instructive. It will be remembered that in the preceding week Gaslight "A" had been violently run down 7½. Last week it suited the operators to have the pendulum swing the other way. So, on Monday, after the stock had been marked at 239½, the process of reinstatement began, and 243½ was recorded. On Tuesday, 244 was reached; on Wednesday, 247; on Thursday, 249; and on Saturday it was repeatedly done at 250. Now, if there be a proprietor who threw his stock away on Monday at 239½, we hope he has taken this lesson to heart. Let him ask himself this question: Was there anything in the position and prospects of the Company to justify its violent depression in the preceding week? If there was not, *habet*. But if it be contended that there was, then we should like to know what unexpected good fortune has befallen the Company to make its stock worth 10 more on Saturday than it was worth on Monday. But it is useless talking to some people. A fair amount of business was done in the 7 per cent. stock at average figures. The 10 per cents. are better; and "J" is quoted 3 higher. But we still have the anomaly that "B," which is a deferred stock, is much higher relatively than the highest of the preferred stocks. South Metropolitans have been the victim of the same tactics as Gaslight. The "B" was run down on Tuesday to 220½; but was speedily shunted on to the up-line, and on Saturday it was figured at 226½. Commercials have been left alone. Suburbans and Provincials have been very quiet. The sole transaction recorded was in Brentford, the stocks of which, it may be remarked, have not moved at all during the agitation. Among the Foreigners, Imperial Continental was treated to the same handling as the Metropolitan Companies, but in a milder degree. It was put down on Monday, and was afterwards put up again more than it had lost. Very little business has been done in Water; but quotations have moved. There is an advance of 3 in New River; a fall of 3 in Chelsea; and a fall of 1½ in Lambeth.

The daily operations were: Activity in Gas on Monday—especially in Gaslight "A," which fluctuated widely. South Metropolitan "B" fell 3; and Imperial Continental, 1. On Tuesday, all attention was centred on Gaslight "A" and South Metropolitan "B." The former rose 3; but the latter fell 1. In Water, Chelsea and Lambeth fell as noted above. On Wednesday, Gaslight "A" and South Metropolitan "B" again had it nearly to themselves. The former rose 2; the latter, 1; and Imperial Continental, 1. Continued activity on Thursday, with all stocks rising freely. Gaslight "A" advanced 2; ditto "J," 3; South Metropolitan "B," 2; and Imperial Continental, 1. New River rose 3. Gas was just as lively on Saturday, and prices all round were at their best; Gaslight "A" making a further advance of 1.

ELECTRIC LIGHTING MEMORANDA.

THE EFFICIENCY OF THE ALTERNATING TRANSFORMER SYSTEM—THE ELECTRICAL PRESS ON THE CITY LIGHTING—THE "DAILY NEWS" ON THE BROMPTON INSTALLATION—LAMP LITIGATION IN AMERICA.

A SUBJECT that is greatly exercising the minds of electricians just now is the precise economy of the alternating transformer system of distribution. From the time when Westinghouse in America simplified the apparatus of Gaulard and Gibbs, and Ferranti followed in England the example set by Westinghouse, it has been generally assumed that this is the cheapest way of supplying incandescent lamps. The smallest mains suffice to convey the high-potential currents of the primary circuit; and the loss in the transformer was supposed to be very trifling. A properly designed and constructed transformer is credited with an efficiency of nearly 90 per cent. Several transformer plants are now at work, however, in different parts of the kingdom; and it has leaked out that there is a wide discrepancy between the coal bills for these establishments, and the theoretical requirements for the amount of lighting actually done. Thus one installation is mentioned (that at Brighton) where the consumption of coal has amounted to 18·6 lbs. per electrical horse power per hour, measured at the consumers' lamps. Mr. R. E. Crompton, who has never believed in the alternating transformer system, pounces upon these figures, and, in an interesting letter to the *Electrical Review*, "exposes the whole trick" of the alternating transformer claims. He points out that the supposed efficiency of these transformers depends upon the condition of their being fully loaded, or worked to their utmost rated capacity; which, of course, hardly ever happens out of a laboratory. Taking the ordinary conditions of domestic lighting, Mr. Crompton shows that even in December an apparatus of this kind would only be loaded on the average to about 53 per cent. of its full capacity for 30 hours in the month, while for 190 hours it would only be loaded to 27 per cent. The efficiency of this transformer would be but 69 per cent. for the best month of the year. For the small requirements of summer lighting, it would fall to 26 or 27 per cent. For the whole year its efficiency would not exceed a mean of 53 per cent. This is for the transformers

alone. If this figure is compounded with the ratios of efficiency of the engines and dynamos, we arrive at "29 per cent. as a total efficiency of the whole system, exclusive of loss in the conductors." This is an aspect of the alternating transformer system which has not received much attention. We should like to know, for example, whether Mr. J. F. Bell had it before him when making up his estimate for a set of this kind of plant for Stafford. As Mr. Crompton puts it, it means that, taking the whole year round, for every 3-horse power generated at the station (and paid for in the coal bills), only 1-horse power of electrical energy appears as light in the consumers' lamps.

As we predicted, the electric light journals have fallen foul of the Commissioners of Sewers respecting the further postponement of the adoption of electric lighting for the City of London streets. Naturally enough, they seize upon one or two weak things dropped in the course of the debate, and jeer at the Commission for coming to a resolution on such arguments. It does not at all follow that the Commissioners as a body formed their opinion regarding the right course to pursue on the ideas set forth by one or two of their number, especially as they had such ample reasons besides for doing as they did. Our outspoken contemporary, the *Electrical Review*, in fact gives up the whole question by confessing that, as a result, improved gas lighting will probably be provided, and by admitting that "without doubt it is by no means necessary to have a better illumination than (say) double that which now exists." It is argued, however, that, for the sake of the private lighting, electricity ought to be patronized by the Commission. This is another question entirely, and one with which the Commission, in its capacity as the highway lighting authority, has nothing to do. By all means let private consumers in the City have the advantage (?) of electric lighting, if they like it at the price; but let it be in the legal way, from a statutory Company. That the Commissioners of Sewers should be expected to help in this matter by paying dearly for street lighting of a kind which they do not really want, is a proposition that, for the present, lacks proof.

Another *Daily News* article on electric lighting in London has appeared—this time with reference to the doings of Mr. Robert Hammond's Company in West Brompton. A good many complimentary things are said of Mr. Hammond in this article; and, of course, there is no cruel reminiscence of the days of that gentleman's lecturing tours and his college for electrical engineers. It is stated that the station supplies only "some 1800 lights;" but of course the future is to be very wonderful. We are told that the fittings for nearly 6000 more lights have been put up in houses in different parts of West Brompton; and "orders are rapidly coming in." One may use as much "salt" as one pleases to this statement. The jump from the 1800 lights *in esse* to the 6000 *in posse* is startling enough; but this is nothing to what follows, for when the station is complete it is expected to supply 100,000 lights. It may at least be said of Mr. Hammond that he never prophesies in the small way. How much coal will he burn at West Brompton to do this amount of work, calculated on the Brighton basis? The rest of the article wanders off into a chat about electrical fittings generally, with no more bearing upon the prospects of the Brompton experiment than on electric lighting anywhere else.

There has been a great lawsuit in the United States between the Westinghouse and Edison interests, respecting the Edison patent rights in incandescent lamps. The issue turned on the question whether the Edison lamp is an infringement of the Sawyer and Mann patents, which belong to the Westinghouse people in America but to the Edison Company in Europe. Judgment has just been pronounced in the case; and the immediate effect is that Mr. Edison did not infringe the Sawyer and Mann patent. This looks at first like a victory for Mr. Edison; but some electricians and lawyers think that the Judge's words are capable of being construed against the existence of any patent right in incandescent carbon lamps. The language of the judgment is clear, however, to ordinary comprehension. It sets forth that, according to the record, nobody before Mr. Edison hit upon the idea of incandescing a filament of carbon, of high resistance, in a perfect vacuum, upon which the practical success of this kind of electric lighting depends. The discovery is credited to Mr. Edison simply because he has a patent for it; and the Court held that, as a matter of fact, the Sawyer and Mann invention was never of any practical value. The Court did not say that none but Mr. Edison had made a practical lamp in the way claimed by him; but no evidence to this effect was forthcoming beyond that relating to the Sawyer and Mann patent, which was dismissed as worthless. It remains to be seen what the Westinghouse people will do next.

THE GAS AND ELECTRIC LIGHT UNDERTAKINGS IN MASSACHUSETTS.

In preceding issues of the JOURNAL (*ante*, pp. 496, 545), we have dealt with the gas undertakings in Massachusetts. We have now to notice the electric light undertakings, the statistics in regard to which occupy a good portion of the report of the State Board of Gas Commissioners, whence our particulars are taken.

The Commissioners commence by alluding to what they regard as the gratifying fact that four of the electric light companies, which were doing business under a charter obtained in another State, were re-organized in the year 1887-8, and received charters in Massachusetts; thereby preserving their privileges. Great activity was shown in the formation of new companies, chiefly in the larger towns; and at the close of the year covered by the report, there were 78 undertakings in operation, compared with 56 at the end of the preceding year. One Company—the Lenox—obtained authority to supply gas as well as electric light. All the companies have to make returns to the Board; and, the business being new and technical, much time and study were devoted by the Commissioners to the preparation of the blank form. In this work they had the assistance of the officers of the companies; and the result was the issue of a form suitable for all companies and every system of lighting. It is given in an appendix to the report. The Company having the largest amount of capital engaged in electric lighting is the Boston, with $870,000; the Edison Company, of Boston, coming next with $500,000. The United Company, of Springfield, have a capital of $150,000; the Middlesex Company, of Lowell, one of $130,630; and the Edison, of New Bedford, the Framingham, the Fitchburg, and the Worcester, $100,000 each. The capitals of the other companies range from $85,000 down to $4000. With regard to the systems used, the Thomson-Houston is in the majority; the Edison coming next. The maximum dynamo capacity is with the Edison Company at Boston—16,400; the Brush, American, Thomson-Houston, Weston, and Sim systems, which are also in use in that city, having a capacity of 5338. The arc lamps are of 1200 and 2000 candle, and the incandescent lamps of 16-candle power. Particulars are given of the total lengths of wire, underground conduit, and streets with overhead wires, as well as of the number of poles set up on June 30 last year. Boston, of course, stands at the head with 1,882,940 feet and 294,840 feet (the Edison Company) of wire; Lawrence coming next, with 881,840 feet and 454,987 feet (the Edison Company). In Cambridge, where the Thomson-Houston and United States systems are used, there are 227,040 feet of wire in use; the length of street with overhead wires being 63,360 feet. The following is the extent of wire in other large towns: Charlestown, 207,000 feet; Brockton (Edison), 364,316 feet; Lynn, 463,720 feet; Lowell, 244,470 feet; New Bedford, 196,290 feet; Newton, 301,000 feet; Northampton, 252,426 feet; North Attleborough, 280,780 feet; Somerville, 381,000 feet. In all of these places the wires are mostly above ground. From the table showing the number of commercial lights of different kinds, and the number of customers for each, we learn that the Boston Company had, at the close of the year reported upon, 1124 arc lights, distributed among 279 consumers; and 1229 incandescent lights, among 81 consumers. The Edison Company in that city had 500 customers, and about 20,000 incandescent lamps. The following are the numbers of lamps in a few of the other large towns:—Brockton (Edison Company), 67 arc and 3455 incandescent; Brookline, 40 arc and 80 incandescent; Cambridge, 26 arc and 200 incandescent; Charlestown, 45 arc, with 12 incandescent off the arc circuits; Lawrence, 94 arc, with 47 arc and 2841 incandescent lamps of the Edison Company; Lowell, 224 arc and 207 incandescent; Springfield, 117 arc and 1976 incandescent; and Worcester, 255 arc and 538 incandescent.

With reference to public lighting, the table giving the number of lamps, their candle power, the number of hours alight per night, and the price paid per night, furnishes the following particulars:—In Boston there are 607 arc lamps, each of 2000-candle power, burning from eight to twelve hours every night, and costing 65c. each per night; the average paid for lamps of lower power being 11·25c. In Brockton the Edison Company have 25 arc lamps, of 2000-candle power, burning six hours a night, at a cost of 42c. each per night; other lamps of lower power, burning 20 nights per month, costing 9·2c., 7·5c., and 6·65c. each per night. In Brookline there are 75 arc lamps of 2000-candle power, and 30 of 1200-candle power, alight from dark to daylight every night at a cost of 50c. each per night for the former—the price for the latter not being given. In Cambridge the 103 arc lamps burn, on an average, for 10½ hours every night; the charge to the user being 50c. each. In Charlestown the price for 70 arc lamps for a similar time is 65c. In Lawrence the Edison Company's lamps are alight every night; but the majority are extinguished at 11.30. Their charges range from 3c. to 17·75c. per lamp per night; the last-named figure being for 32-candle power lamps. In Lowell there are 152 arc lamps burning all night, at 50c. each per night. In Worcester the 138 arc lamps are alight every night from dark till daylight; the charge being 55c. each. For commercial lights various prices are charged. In Boston the arc lamps run from 85c. down to 50c. per day, according to number and the length of the contract. The incandescent lights of 16-candle power are charged at special rates, varying from 1·2c. to 3c. per hour, leased on the average number of hours they are alight each day. The customers are charged for inside wiring; and lamps not broken by them are renewed free of cost. The Edison Company charge in Boston 75c. per 1000 candle-hours for their incandescent lamps; in Brockton, 1·72c. per 16-candle power lamp-hour. In Brookline, 8c. per hour are charged for the arc lights; for the incandescent, $1 to $1·50 per month. In Cambridge the arc lights are charged at per annum, according to the number of days and hours; for the incandescent lamps, 1c. per hour for 16-candle power lights, and higher powers at annual charges ranging from $24 to $48. In Charlestown the prices of arc lamps are 50c. to 75c. per night; incandescent, 50c. per night per group of eight 16-candle power lights. In Lowell, the price of arc lights is 50c. per night, till midnight; incandescent, $1·50 per 16-candle power lamp per month. In Lawrence, arc lights used for three nights per week cost $6 per lamp per month; for six nights, $8; and for seven nights, $10. In Worcester the prices for arc lights vary—50c. to 70c. per lamp per night being the figures; for incandescent lamps, the charge is $1·50 each per month.

The supply of the electric light by gas companies is a question which has been more closely considered on the other side of the Atlantic than in England. It may be interesting to our readers to know that, prior to Jan. 1 last year, eleven Gas Companies had been authorized to furnish electric light—in the case of seven by Special Acts, by the terms of their Charter, or with the unanimous assent of the stockholders, the other four by order of the Board; but three Companies had not availed themselves of the privilege. During the year 1887-8 the Board granted electric lighting powers to the Beverley, Chelsea, Holyoke, New Bedford, and Newton Companies; periods of three and six months being allowed for procuring the necessary plant. The petition of the Chelsea Company roused the Boston Electric Light Company, who had electric lighting powers in the town, and had put up some lamps. It was admitted that there was not room enough for two electric lighting companies in the place; and consequently an arrangement was come to for the purchase by the Chelsea Company of the plant already in position. At New Bedford the Gas Company were opposed by the Edison Company; but the Board granted the petition. The Gas Company purchased the plant of the New Bedford Electric Light Company, and secured the co-operation of that Company in the development of this branch of their business, which has considerably increased. The output of gas in the year ending June 30, 1888, was nearly 10 per cent. more than in the preceding twelve months; while from March 1, 1888, to the date of the report the electric light business increased from 154 to 195 full arcs, 18 half arcs, 43-horse power of motors, and nearly 2500 16-candle power incandescent lamps. At the same time the operations of the Edison Company grew to the extent of about 50 per cent. At Beverley the Gas Company agreed to purchase the plant of the Beverley Electric Light Company; and there was no opposition. In the case of Holyoke, the stock of the Holyoke Electric Light and Power Company was practically owned by the Holyoke Water Power Company, who had the right to supply the town with gas, and had done so for many years. The Board therefore considered the Company should be authorized to supply the electric light; and, no one opposing, the petition was granted. The petition of the Newton Gas Company was opposed by the Newton Electric Light and Power Company. A request, signed by about 500 of the inhabitants, was presented in support of the petition; and one, equally numerously signed, against it. It was therefore manifest that much interest was felt in the matter. This was heightened by negotiations which had taken place between the city authorities and the respective Companies in regard to the street lighting; the prevailing opinion being in favour of electric lights. The Electric Light Company had named a price for which they would do the work; the Gas Company proposed to do it for something less, if they could have authority to engage in the electric light business. After hearing the parties, the case was adjourned. On the matter being subsequently reopened, the Board found that the Gas Company had conditionally bought the electric light plant on terms mutually satisfactory to the Companies, both of which now joined in asking that the petition should be granted. Believing that the permanent interests of the inhabitants could be best secured by allowing the Gas Company to furnish both kinds of light, the Board granted the petition. On this case the Commissioners make the following remarks, with which our notice of their interesting report must close:—"A company which practically asks the privilege of doing all the lighting must likewise be mindful of its duties, and be ready with the best appliances and the most economical methods to meet every reasonable demand. The community has come to regard the certainty and regularity of dividends as the best test of the value of securities, and the enjoyment of something like a monopoly must be accompanied with a willingness to accept of only fair and moderate dividends. A monopoly of this kind, supplying what has come to be regarded, not as a convenience merely, but as a necessity, will be tolerated only so long as it deals fairly and honestly with the community. Its only right to exist rests on the benefit it brings."

In connection with the recent changes in the management of the Great Yarmouth Gas Company, consequent on the retirement of Mr. Willis from the post of Secretary, we learn that Mr. Charles Ellis, the Chief Clerk, will continue the superintendence of the outdoor work.

We have received from M. Guéguen a copy, in pamphlet form, of the paper presented by him at the last meeting of the Société Technique du Gaz en France, on the "Radiation of Heat, considered in its Applications to Lighting and Heating," for which, it may be remembered, he was awarded a prize of 1000 frs. A brief indication of the scope of M. Guéguen's work, and of the conclusions to which his studies had led him, was given in the general abstract of the papers brought before the Society which appeared in the Journal for July 23 last (p. 165); and now that the *mémoire* has been issued in the convenient form in which it is presented, an early opportunity will be taken of dealing with it at greater length. As the Editor of the *Journal de l'Eclairage au Gaz*, M. Guéguen occupies a prominent position in connection with the literature of the gas industry; and the character of the papers he has already published on questions bearing upon the theory and practice of gas manufacture, and for which he has carried off several prizes, entitle his latest production to attentive consideration as the work of a careful investigator. The pamphlet is published by M. Michelet, of Paris.

CRIPPS ON GASHOLDER FRAMING.*

This valuable book, the importance of which is not to be measured by its bulk, is what gas-works designers have been vainly seeking for many years. Until quite recent circumstances brought the subject into prominence, so that its importance was recognized by capable investigators, the whole question of structural gas engineering remained utterly outside scientific inquiry. If an engineer wished to roof a retort-house, to erect a viaduct, or to build a retaining wall, he could find out all he wanted to know about the strains to be provided for, and the dimensions to be given to his scantlings, by referring to recognized authorities on these matters. If he had to design a gasholder, however—by far the most serious undertaking of his specialized profession—he had nothing to go by beyond his own natural lights. One or two memoranda of strains in gasholders were, indeed, preserved in the Journal, and in "King's Treatise on Coal Gas." But these were translations from foreign sources; and it could not be said that the boldness or originality of foreign designers was such as to warrant their being looked up to as masters in this branch of engineering construction. Consequently, gasholder design in this country, where the most important works of the kind were needed, became an unintelligent process of copying previous examples. A few engineers with exceptional opportunities happened to be inspired with some progressive ideas on the subject of gasholder design; and upon these the others waited, as it were, open-mouthed. If one of them put up a holder differing in any advantageous way from what had gone before, all the rest of the profession prudently reserved judgment on the experiment until they saw that its success was assured. Then they copied it. Anything like a critical examination of gasholder designs was unheard-of, because the necessary data did not exist on which principles could be based. Text-books on gas engineering merely gave lists of works executed, with their dimensions and scantlings; but whether this or that example was dangerously weak or wastefully heavy, nobody ventured to say, because nobody knew. Some constructors had a heavy hand; while others preferred to risk it with "gossamer holders." But the choice was a matter of individual taste. As already remarked, such observations on gasholder strains as had been published were of scarcely any value; and constructors were compelled to copy what others had done—altering a little here and there as that most treacherous guide, an untrained and unassisted judgment, dictated. There was safety in this course so long as gasholders only grew by a foot or two in diameter. It was easy to strengthen a curb here, and add rigidity to a guide there, and so adapt for a 120-feet holder a design that had proved strong enough in the case of a 100-feet holder. Sources of weakness were gradually recognized as experience ripened; and as there was nobody to laugh at the waste of material which necessarily accompanied this tentative progress, the idea that it might be wrong in certain respects never occurred to the average designer. The first shock to the jog-trot style of progressive gasholder construction was administered by Mr. George Livesey, who, having to provide a great deal of storeage accommodation for the rapidly increasing district of the South Metropolitan Gas Company, could not wait for holders to grow by degrees to the size he required, but was obliged to "take the bull by the horns," and work out a rational principle for his own guidance in this task. If Mr. Livesey had been a timid man, he might have taken refuge in the oracular statement that gasholders were big enough, and he would undoubtedly have been applauded as prudent if he had declined to go beyond the multiplication of holders of the largest size known before 1878. A number of these structures, collected in several stations or scattered over the district of supply, would have appeared to ordinary gas engineers at that period the most natural and reasonable way of providing storeage. Fortunately for science, as well as for the finances of his Company, Mr. Livesey decided to open a fresh page in the record of gasholder construction; and with his demonstration of the error of the columnar system of guide-framing, new possibilities opened before the constructor, and the limits of size for gasholders faded once more into the horizon. Gasholders no longer crept onward, in point of capacity, by tens or even hundreds of thousands of cubic feet, but swelled by millions with every fresh example.

Still, a comprehensive theory of gasholder stability, on the faith of which fresh departures might be made, was wanting. Mr. Livesey himself was not satisfied on this point; and called in Mr. B. Baker, the renowned designer of the Forth Bridge, to unlock the mystery with the key of mathematics. The result was not wholly satisfactory. Mr. Baker did much useful work on the problem; but the whole subject of gasholder construction and working was evidently foreign to him, and he missed the point of the inquiry. Up to this time it cannot be said that any great amount of interest in these matters was taken by anybody outside a small circle. In the year 1887 a new start was made—as Mr. Cripps very fairly acknowledges in the preface to his book—by the proposal of Mr. W. H. Y. Webber to dispense altogether with lofty guide-framing, on the ground that the stability of a holder depends more on the bottom than on the top rollers. This suggestion set many people thinking. Mr. George Livesey, to whom the idea that guide-framing might be partially abandoned, so far at least as the top of a telescopic

* "The Guide-Framing of Gasholders, and other Papers chiefly relating to Strains in Structures connected with Gas-Works." By F. Southwell Cripps, Assoc. M. Inst. C.E. London: Walter King; 1889.

gasholder is concerned, had occurred some time previously, proved the correctness of the new principle at Rotherhithe, where a double-lift holder was raised by the addition of a third lift without correspondingly heightening the guide-framing. The only question then remaining was the extent to which this suppression of guide-framing could be safely carried. Mr. Cripps thereupon entered the field, and published some articles in the JOURNAL to prove that this could not be done beyond the point to which Mr. Livesey had gone at Rotherhithe, unless with some special modification of the holder—such, for example, as the spiral guiding of Mr. Gadd, or the rope stays of Mr. Pease. Although Mr. Cripps's mathematics and diagrams were open to the reproach of being critical rather than constructive—*i.e.*, they helped him to comment upon what others had said or done before, but did not suggest anything of the kind to himself—this is very largely the quality of most of the theory that is brought to bear upon engineering practice. Mr. Cripps (writing under the *nom de plume* of "Theory and Practice") nevertheless did good service in checking the extravagance that might otherwise have marked the discussion of the new ideas of gasholder guiding. Having once begun the criticism of these suggestions, Mr. Cripps elaborated his work into a statement of the principles of gasholder guiding, which, for completeness, throws into the shade everything that had previously been attempted in this way.

The book now under notice is not merely a reprint of Mr. Cripps's scattered papers, but much of the matter has also been re-written and greatly expanded, with additional diagrams, formulæ, &c. We could, indeed, have wished that more of this had been done; for the aspect of controversy which the earliest chapters still wear is rather out of place in a book intended to be of permanent value. Thus, on the fourth page the author announces the conclusion "that gasholders cannot work at all without at least two tiers of rollers to each lift"—a statement which should have been qualified in some way to admit of the devices to the contrary that have arisen out of the discussion provoked by Mr. Webber's suggestion. The assertion may be justified in the case of gasholders guided according to the methods known when it was made; but it reads a little too sweeping now. It cannot but be gratifying, moreover, to those daring innovators who challenged the Arson method of stating the strains on gasholder guides, to be assured on the authority of Mr. Cripps (who certainly did not commence his investigations from their side of the question) that "*under certain conditions* it may be admissible to reduce the height of the guide-framing to that of the depth of the outer lift only, but no shorter." This concession is enough to justify the rebellion against the old method of computing the distributed strains. As to the qualifying conditions cited by Mr. C ripps, the weight of these must be determined by individual judgment and experience.

For the first time we find in this book a critical examination of the strength of completed structures; the examples taken being Mr. Livesey's lattice-framed holder at the Old Kent Road, Mr. Hunt's Birmingham holders, Mr. Livesey's great four-lift holder at East Greenwich, and the Rotherhithe holder that has been "trebled" without raising the guide-framing. There is nothing like this in gas engineering literature; and it would be impossible to exaggerate the educational value of these investigations, carried on as they are by simple arithmetical operations that fall within the power of any student competent to work out a simple formula. When we say that the sign of the calculus does not appear in any part of the work, and that even when grappling with "bending moments" Mr. Cripps's formulæ do not present any terrors to a student armed with a table of five-figure logarithms, we have said enough to distinguish his mathematical methods from those that disfigure most French and German professional writing. Who does not know the sick feeling that comes over a practical man in search of information, when, after being led, by the simple and plausible opening of a memoir, to believe that it may give him the light he requires, he is suddenly brought up in front of a terrible theorem, which to him is as unintelligible as a Sanscrit text? His disappointment is, moreover, apt to be tinged with anger at the writer, whom he cannot help accusing of desiring to show off his own schooling, rather than of helping less favoured mortals. There is always this principal objection to highly mathematical papers on engineering subjects: Good mathematicians, for whom the abstruse formulæ have no difficulties, do not want these elaborate demonstrations; and men of feeble mathematical powers are not able to profit by them. Mr. Cripps knows for whom he is writing, however, and keeps his arithmetic down to the standard of busy men, whose facility in turning algebraic expressions inside out, if ever acquired at school or college, is apt to disappear in the rough rubbings of their every-day work.

Altogether, we can most heartily recommend Mr. Cripps's book to every gas engineer and student of gas engineering construction. It is absolutely necessary to the latter; and will be found one of the best possible aids in the deliverance of gas-works construction from the reproach of unintelligent copying and subservience to the rule-of-thumb. It should be stated, that besides the chapters on gasholders, the book contains a study of the strains on large purifiers, which is eminently worthy of attention. The volume is a very presentable one, and is printed in clear type on good paper.

MR. J. H. BRODIE has been appointed Secretary of the Keswick Gas Company in succession to Mr. R. Broatch.

Communicated Article.

THE LATE MR. JOHN REID.

By D. BRUCE PEEBLES, of Edinburgh.

Time is bringing about great changes; and the old pioneers of the gas industry are gradually being thinned out. The obstacles which they had to encounter, and which they so bravely overcame, can hardly be realized by the young generation of gas engineers, who during the last ten or fifteen years have gone into harness, and are fitly carrying on their work—not without their difficulties, but under very different circumstances from those in which their predecessors were placed. In times gone by, there certainly was not much interference with the gas manager. The gas-works were considered by many to be mysterious places, where a secret manufacture was carried on which they could not understand and had no right to inquire into. Such a "thorn" as the sulphur question had not grown; the utilization of the residual products was little thought of; and the gas manager, unhampered by Acts of Parliament or sanitary bye-laws, was a king within his own gates. But he had to work under many disadvantages and difficulties which have gradually been removed by inventors and by eminent gas engineering firms, who are ready to supply every requirement necessary for the production, distribution, and combustion of what is now a necessary of mankind. The Scottish gas engineers have had great advantages. The abundant supply of rich cannel coal lying to their hand enabled them to carry on their operations with less labour, smaller works, less storeage capacity, and better acceptance to the public than their less favoured brethren in the South, who had to content themselves with coal of an inferior quality, and to battle with impurities much more difficult to remove than they are now. To this difference in the quality of the gas produced in the two countries may be attributed the fact that in Scotland gas has all along been almost universally introduced into dwelling-houses, whereas in the South the candle and the Argand oil-lamp still largely hold their own. Scotland owes much to her gas engineers, many of whom were, and are, men of high attainments and great practical ability; and it is sad when we have to record the removal by death of those who have "borne the burden and heat of the day," and by their labours have earned the respect and gratitude of their brethren in the profession.

On Wednesday, the 23rd of October, Mr. John Reid, formerly Manager of the Edinburgh and Leith Gas-Works, died at Rosemont, Ferry Road, Edinburgh. For some months prior to his death, Mr. Reid had been in feeble health; but it was not thought by his friends that his end was so near. Born in Perthshire in 1812, Mr. Reid was, with one exception, the oldest gas manager in Scotland; and he saw the industry with which he was so intimately connected rise from small beginnings to the great magnitude at which it has arrived at the present day. His father was the Engineer and Manager of the Perth Gas-Works, and was the first to introduce clay retorts into Scotland; and their use gradually spread until, for continuous work, they entirely displaced the iron retort. He had heard of them being employed in England, and at once appreciated their value. His son, when a boy, must have been familiar with many of the difficulties which had to be contended with; and Lord Palmerston's remark that "dirt is only matter in the wrong place" was proved to be true long before it was given to the public. The disposal of the tar made at the Perth Gas-Works was a matter of sore perplexity; and the late Mr. Reid used to tell the story of a man coming to his father and advising that a hole should be dug in the North Inch (one of the fine grass parks belonging to the citizens of Perth), so as to get the nasty stuff put fairly out of sight. Colours of the brightest hue, and sweetness surpassing the honeycomb, lay hidden in the despised tar; emphasizing Lord Palmerston's apophthegm, and waiting for the chemist to loosen their bonds and set them free for the admiration and use of the world.

An incident which happened in Mr. Reid's boyhood left a lasting impression on his mind. Mr. Green, the famous balloonist, visited Scotland, and made ascents in his balloon from many of the chief towns. He visited Perth; and, as a matter of course, had to go to the gas-works to arrange about getting his balloon filled. Young John heard all about it, and no doubt watched the operation with interest. The balloon was inflated in a satisfactory manner, and everything was ready for a start; but an unforeseen hitch in the proceedings occurred. A gentleman had paid some five or ten pounds to be allowed to make the ascent with Mr. Green; and whether or not at the last moment his heart failed was not known, but at any rate he did not appear to take his place. The time was getting on. The hour advertised for making the ascent was long past, the crowd was getting anxious, Mr. Green's patience utterly exhausted; and he was at his wits' end what to do. On the spur of the moment, he cried out, "Jump in, John," and the boy did so. Mr. Green followed; the moorings of the balloon were speedily loosened; and away went the balloon, followed by the cheers of the crowd. Mr. and Mrs. Reid were not on the spot at the time, but their attention was soon called to the circumstance; and it may be imagined that their feelings were of a very mixed kind when they saw their young son soaring away to the clouds with all the chances of danger and accident before him. As it happened, the descent was not without peril, for the balloon became entangled among some trees, and was landed with a good deal of difficulty. The boy evidently had no fear, but must have been absorbed in watching the city diminishing in size, the landscape enlarging and widening to the view, the increasing stillness

of the seeming nothingness with which he was surrounded, and the ease and distinctness with which sounds, such as the bleating of sheep and the lowing of cattle, could be heard when the balloon was at its highest altitude. These impressions he carried with him through life; and in relating the adventure, as he now and again did when chance conversation brought on the subject, he evidently looked back on his early aërial trip with pleasure.

There being little business done in Perth connected with engineering, Mr. Reid was sent to Dundee and apprenticed to Messrs. Brown and Allan, machine makers. During his apprenticeship, he met and renewed his acquaintance with Robert Nicol, the Scottish poet, and an old school-fellow. Both had been members of a juvenile debating society in Perth; and the reunion in Dundee was of the pleasantest kind. Nicol was a poet who was considered by many to be only second to Burns; and Mr. Reid used to say that he never saw such eyes as Nicol had for brilliancy and expression. He died early, and was buried in North Leith Churchyard—a place which in after years Mr. Reid had often to pass, and it grieved his leal heart to see that nothing but a poor-looking weather-worn stone marked the spot where his old friend—one of the brightest and sweetest of Scotland's poets—was laid. To the honour of Mr. Reid, he set to work and had a subscription started, to which he himself liberally contributed; the result being that a handsome granite monument was erected, and will long mark the resting-place of Robert Nicol.

After serving his apprenticeship, Mr. Reid, like so many of his countrymen, turned his face southwards with a wish to see a little of the world, and to gain general knowledge and experience of engineering. He worked for a considerable time in England, as well as in Holland, and on his return to Scotland was appointed to the situation of Gas Manager at Montrose. He evidently liked his duties and the place, as well as the people; so he cast anchor, settled down, and married Miss Janet Thompson, the daughter of a wealthy merchant, made many friends, and soon acquired influence in his new position. The gas-works were not of such a size as to require the constant attention of a man of his ability. So after being put in good working order, the young engineer had to look about for some sort of work or recreation to fill up his spare time. He soon became interested in a matter which gave him a good deal of both. Montrose had long been supplied with water from a fine spring; the supply being conveyed and distributed by wooden pipes. These, however, gradually became insufficient to carry the water to an increasing population; and it fell to Mr. Reid's charge to replace them, first by lead, and latterly by cast-iron pipes. Notwithstanding this, the supply again ran short; but this time it was not the fault of the pipes—it rather lay with the spring, which could not be made to yield more than it had been doing, and therefore was not capable of responding to the increasing wants of the community. Mr. Reid foresaw the difficulty, and spent a good deal of time exploring the North Esk River, which wanders from the Grampians for nearly forty miles until it reaches the sea; and he thus made himself thoroughly familiar with the stream. The Town Council were at last compelled to look about for additional water, and advertised for engineers to give plans for bringing a supply from the North Esk. Mr. Reid was selected from among a number of applicants, and was appointed to carry through the work according to his plans. This he did, to the great satisfaction of all concerned, and at the moderate cost of £8242—this sum including everything. The water-wheel and pumping machinery were started in 1857, and have gone on doing their work satisfactorily ever since. The scheme and the manner in which it was carried out met with the marked approval of Mr. Thomas Hawksley and Mr. J. Leslie, the well-known Engineers.

In 1860, Mr. Reid was appointed Engineer and Manager of the Edinburgh and Leith Gas Company. He evidently inherited his father's gift for keeping well to the front in everything relating to the manufacture of gas; for no sooner did he get settled in his new position than he commenced remodelling the works—casting out old worn-out apparatus, and replacing it with the best and most improved machinery and apparatus that could be obtained. The undertaking was in anything but a flourishing condition; and it was only after long and persevering efforts that its affairs were gradually led to a turning-point, and a course of prosperity entered upon which has continued ever since, as was very clearly shown when exhaustive investigations were made before the transfer of the works to the Corporations of Edinburgh and Leith, which took place about a year ago. When a clever man has been long connected with a business or undertaking which has flourished under his guidance, it will generally be found that he leaves a momentum behind him which continues for a time, even without much attention. Servants cannot give up old acquired habits in a moment, and so the work goes on. It so happened, however, that when Mr. Reid, under medical advice, retired in 1878 from his post, he was succeeded by his able assistant, Mr. F. T. C. Linton, who, instead of letting things sleep, gave a fresh impetus to the work. Consequently Mr. Reid, in his retirement, had the great satisfaction of seeing things pushed forward rapidly, so as to secure greater efficiency, and witnessed the new system of regenerative firing adopted and carried through by his successor, which helped still more to increase the prosperity of the Company, and bring it into the satisfactory condition in which it was found by the Corporations when the works were handed over to them.

Recent revelations in connection with gas-works management have brought to light dishonesty, breach of trust, perjury, and utter disregard of the principles which every man should hold dear. The bottom seems hardly to have been reached yet; but what has been disclosed must have given pain to many good men whose lives and actions are beyond reproach. The honest man is sure to suffer in some degree when a rogue in the same profession is found out. In connection with this subject, a scandalous correspondence which took place in the *Glasgow Herald* in 1876 may be referred to. It was brought about by the publication of a letter from a coal master—how history repeats itself—whose statements, had they been true, would have blackened the character of almost every gas manager in Scotland. Mr. J. K. Watson, so long the much-respected Treasurer and Manager of the Edinburgh Gas Company—under whose able management the Company had a career of almost unexampled prosperity; at a meeting of the North British Association of Gas Managers held in Edinburgh, protested, in eloquent and indignant language, against the charges which were thrown broadcast against the profession. Mr. Reid was also indignant and had to defend himself; but the charges came against him in a rather more personal manner. One of his Directors, with ears ever greedy for gossip, and mind open to take in anything in the way of a fault, told a co-Director that Mr. Reid was no doubt having a fine time of it; that it was well known that every gas manager took commissions, &c. The Director who listened to the story was a friend of Mr. Reid's, and told him what had been said. The result was that Mr. Reid at once went to his office and instructed a clerk to make out a list of every person and firm who had supplied goods to his Company during the whole time he had been in the service. With this document in his pocket, he quietly waited for the next meeting of Directors, and, after the ordinary business had been gone through, he addressed the Chairman as follows: Sir, one of the Directors, who is now present, has, without the slightest cause, tried to damage my character by stating that I am, and have been, in the habit of taking commissions on goods supplied to the Edinburgh and Leith Gas Company. As the Manager, and also as a shareholder of that Company, I call upon him to substantiate his charges. Here is a complete list of the individuals and firms who have sent goods to the Company during my term of office, and I ask him to put his finger on any one of these from whom I have received a bribe or have taken commission." The gentleman—or rather the Director—who had made the charges stammered out that he did not mean this, and did not think that; and, in a rather incoherent way, tried to wriggle out of the thing. But it would not do; and the meeting was not allowed to come to a close until he had withdrawn every statement, and made an ample apology. All honour to such men as the late Mr. Reid. The honesty of character brought out by such an incident as that just stated keeps the memory of such men green, and is the silver lining to the cloud of sorrow that hangs over those relations and friends who are left behind.

Mr. Reid was an ex-President of the North British Association of Gas Managers; and at the last meeting, which took place this year at Dunfermline, he was elected an honorary member. He was a Fellow of the Geographical Society and a Fellow of the Royal Scottish Society of Arts, to which Society he contributed some excellent papers, which appear in the Transactions. His first contribution gave a description of a new gas-governor he invented for street mains, and a governor for controlling the flow of water in mains. In 1863 he gave a description of the water-works he designed and completed for Montrose, for which he was awarded the Society's silver medal. In 1867 he brought before the Society his invention of a new revolving washer for gas; being the first washer made of a type which has now become common. In the course of the paper he said: "I estimate that every 1000 cubic feet of gas should be treated with 100 gallons of water. The water of course should never be below 4° or 5° of saturation; otherwise it has a deteriorating effect on the illuminating power. The constant elevation of this body of water to the top of the vertical washer is expensive in engine power, and the machine is liable to get out of order. The leading idea of my washer is to substitute a horizontal instead of a vertical passage for the gas." This idea, as is well known, has been adopted and carried out most successfully of late years; and rotary washers of great size and power are being largely introduced. For this paper and invention he was awarded the Society's silver medal and plate. In 1871 he brought before the Society a working model of a water-meter, having a piston of such a novel and remarkable type that it elicited a very high compliment from the late Professor Fleming Jenkin. The idea of such a motion could only have been developed in the mind of an original thinker; and the Committee appointed by the Society reported most favourably upon it. For this paper and invention Mr. Reid was awarded a Keith prize, of the value of £10. So lately as the 9th of January last, Mr. Reid presented another paper to the Society, giving a description of a hydraulic hoist designed to effect great economy in working; and for this he received the Society's silver medal.

In private life, Mr. Reid was much liked; and those who had the privilege and the pleasure of meeting him and his wife and niece at Rosemont who vied with each other in kindness and hospitality will not soon forget the merry gatherings which passed so pleasantly. Song and story, with a spice of Science, made long evenings seem short. Mr. Reid was deeply versed in Scottish lore; and his singing of old humorous Scottish songs was admirable. With young people he was a great favourite; and it was pleasant to see how he could unbend when in their company. He puzzled and at the same time delighted them with many curious questions

and pleasant stories; and they would gather round him, and make up to him with instinctive liking—a true sign of what may be termed the "magnetic influence" of his kindly nature. He had much sympathy with the poor; and his kindness of heart was widely known, for he was liberal in giving. Many will miss him; and those who knew him best will miss him most. They will feel that there are few left to fill his place, and will mourn over the loss of one who was an honest man and a true friend.

Technical Record.

GAS AS AN AUXILIARY OF COKE FOR HEATING PURPOSES.

The approach of winter and the appearance of one of its principal attendant discomforts—fog—have again turned public attention to the question of the abatement of smoke. In our editorial columns last week, when commenting on the recent article in the *Engineer* on this subject, it was remarked that if the smoke evil is to be eradicated, it will only be by the extension of the use of gas as fuel. This was, of course, only a repetition of what has been stated over and over again; and if, notwithstanding the frequent enforcement of this truth by those who are interested in the extended use of gas, the adoption of this form of fuel for heating as well as cooking purposes has not been more general than we have found it, the explanation must be sought in the fact that English householders are slow to adopt new appliances, or, having adopted them, are dissatisfied with their performance, and have gone back upon the old lines. The gas heating-stove, in order to make its way, has to conquer the predilection of most English people for the open coal fire, which they dearly love to stir vigorously. The ordinary gas-stove does not pretend to imitate the coal fire; and therefore however excellent it may be as a warming appliance, it would not be favourably regarded by those who like to look upon a grate full of glowing fuel. An attempt to meet the wishes of these people has been made by the makers of asbestos gas-fires, which have all the glow and flicker of coal, without its attendant dirt and smoke. These stoves give satisfaction while burning; but to the minds of many people the white lumps of asbestos have a cold and cheerless appearance when the stove is not in operation. This objection presented itself forcibly to the mind of the late Sir W. Siemens, who took up the question of the utilization of gaseous fuel for the abolition of smoke about ten years ago, with the result that he devised an arrangement by which, while retaining the general plan of the ordinary fireplace, gas could be employed in conjunction with coke for the heating of apartments. The stove, as our readers may remember, was shown at the Smoke Abatement Exhibition at South Kensington; and it has been described and illustrated in the JOURNAL. It consisted of a grate filled with coke, upon which jets of gas—or rather a mixture of gas and hot air—were made to play; thus ensuring a smokeless fire of high heating power. An objectionable feature of the arrangement was the hot-air supply, which necessitated the reconstruction of the lower part of the grate; moreover, it offered some obstruction to the free removal of the incombustible residue of ash, the retention of which impeded the combustion, and rather militated against the brightness of the fire. The stove has since been so simplified as to leave the grate exactly in its original state, just as for an ordinary fire; all that has to be done being to place at the front, between the two bottom bars, a piece of iron gas-pipe pierced with a few holes pointing obliquely upwards, so as to throw, when supplied with gas, jets of flame into the body of the fire. The holes may be about the size of a knitting-needle, and about 1½ inches apart. If gas is already laid on, a gas-fitter could make the necessary connections and fittings in a few hours without difficulty.

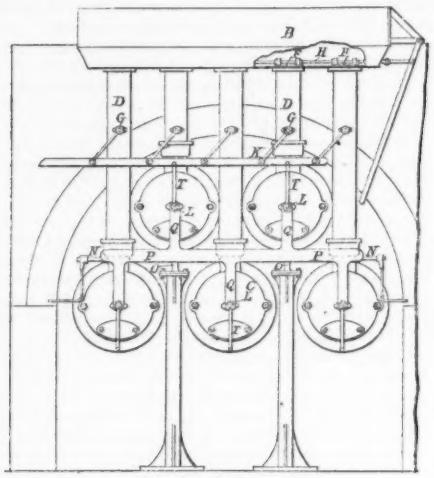
The foregoing is a brief description of the Siemens "gas-aided domestic fire," to which the attention of architects, builders, and others has lately been specially directed by an article contributed by Dr. W. Pole, F.R.S., to the *Builder*. Having described the arrangement, the author points out that it is in every respect an ordinary fire, with the exception of possessing the advantage of assistance, when desired, from gas-flames. He then proceeds to inquire what this assistance is worth. "In the first place," he says, "it enables coke to be used. This is a better fuel in many respects than raw coal; it makes a steadier, more compact, and more enduring fire, and does not give out smoke or soot. It is difficult to keep coke alive in an ordinary grate, unless the burning mass is large, and the draught powerful; but with the addition of the gas it burns perfectly, in any quantity, and, in fact, as is well known, the gas re-supplies to the coke the hydrocarbons which had been abstracted in the gas-works, and so restores the original elements of the fuel, but in an improved and refined form." Dr. Pole has found, however, that it is advantageous to have a small supply of coal to put on in addition to the coke, by which the use of the gas may be much lessened, and, indeed, often stopped altogether; as the mixed fuel will make an excellent, pleasant, and economical fire without it. A little experience will, he says, soon give instruction on this point. It is worthy of notice that the coal when burnt in combination with the coke and the gas, makes much less smoke than when consumed alone. This is easily accounted for. The cause of the production of so much smoke from the coal in an ordinary grate is the low temperature at which its decomposition is effected; here the particles of coal are enveloped in hotter surroundings, and the combustion is consequently more complete. Another advantage attending the use of the stove is the reduction of smoke from the fire. This is not only an infinitesimal contribution to the general smoke abatement movement, but is an advantage to the householder himself. It diminishes the spread of dirt in the room, and either abolishes, or, at least much lessens the frequency of the great nuisance of chimney sweeping. The gas gives the facility of lighting the fire at any moment without the usual trouble of laying. With this plan, a fire never need go out; a little of the gas aid will suffice to check this natural tendency, and the fuel will go on burning till exhausted, and even then the gas will keep the grate warm. Hence stirring or poking the fire becomes unnecessary, or, at least, is only required at long intervals to help the exit of dead ashes through the bottom grating. The grate need never be emptied, except occasionally for cleaning. With the ordinary fire, it is customary to empty the grate before every new laying, when a great deal of valuable fuel, in the shape of cinders, goes to the dust-hole. With the gas arrangement, all that is necessary is to rake out the incombustible white ash, leaving the carbonaceous cinders behind, to be burnt with the new fuel. The gas gives altogether a new power over the fire—namely, that of its regulation according to what is wanted. It is not so much the gas itself that is regulated, as the influence of the gas upon the fuel. It acts as a sort of blowpipe. When full on, the combustion is highly active, but the stimulus can be lowered to any extent, or entirely withdrawn. The combined use of coal and coke greatly facilitates this regulation. The gas arrangement may be made of great use even without the fire. In winter, when several fires are burning, and doors and windows are closed, the whole atmosphere of the house becomes subjected, by the action of the fires, to a slight exhaustion, and every chimney where there is no fire is liable to have a down-draught into its room. In such a case, a slight use of the gas alone will keep a proper current up its own chimney, and give a gentle warmth in the room, at very little cost. Even in summer the gas is still useful. A chimney is the ordinary and often the only ventilator for rooms; but when there is no fire, the chimney, having no motive power to give it a current, does not act. In this as in the previous case, the gas may be used to give a current up the chimney—a screen being hung on the front of the grate to prevent the heat radiating into the room. Moreover, the gas is always at hand, ready for any accidental heating required.

Dr. Pole considers that a fire which possesses all the capabilities above enumerated becomes an object worthy of more intelligent care and attention than it has hitherto received. With regard to cost, the outlay for construction is exceedingly small; and therefore only current expenditure has to be taken into account. In the first place, this must naturally be much less than for the asbestos gas-fire, in which the whole heat must be furnished by the gas; seeing that in the plan here described the coal and coke form the efficient fuel, to which the gas is only a subsidiary aid. Dr. Pole finds that in his grate, which is of moderate size, the six jets when in full blaze consume about 20 cubic feet of gas per hour; but this is only exceptionally necessary, to light or quickly to strengthen the fire. The gas is frequently shut off entirely; and about 10 feet may be estimated as an ample average. This will cost in London about ½d. per hour. This would not be a very high price to pay for the advantages named; but it must be recollected that there is a large set-off to be made for savings. In the first place, there is the use to a great extent of coke, which is more economical than coal. Then there is much economy in the saving of the cinders; in the easy regulations of the fire according to demands, particularly by keeping it low; and, still more, in the power of extinguishing it when not wanted, with the option of lighting again at a minute's notice. These savings cannot be put in definite money value; but they will certainly reduce materially, if not cancel entirely, the cost of the gas. It has been thought that the small holes in the gas-pipe would soon become stopped up by fine ash. Dr. Pole states that experience negatives this fear; and it would seem that generally the current of gas through them suffices to keep them fairly open. It is, however, he says, desirable to have an appliance at hand by which they can be cleared at any moment; and the tube itself should be connected by a screw, so that it may be taken off occasionally to be cleaned or renewed whenever burnt or worn away. Summing up the advantages, to his mind, of the Siemens arrangement, he puts first of all the great comfort, convenience, and utility in domestic economy, ensured by employing gas as an auxiliary to coke in making a fire. In the next place, it does not require a new grate, but only a small addition to the ordinary one. Lastly, the increased expenditure for gas is very small, and is largely compensated for by greater economy of fuel in other ways.

THE EFFECT OF THE ELECTRIC LIGHT ON WATER COLOURS.—Mr. J. J. Hissey, writing to the *Standard* recently cautioned the public against placing incandescent electric lights in close proximity to water colour paintings; he having found, after three years' experience with the light in his own house, that this illuminant so placed is sufficiently powerful to cause some of the more delicate pigments to fade in a greater or less degree. He finds that water colours that are safe in diffused daylight are certainly not always so when exposed night after night, for many hours, to the active white light of electricity close at hand. It has always been claimed that the electric light has no injurious effect on paintings; and therefore it would be interesting to hear the experience of other possessors of such works of art placed under similar conditions to those of our contemporary's correspondent.

ELLIOTT'S APPARATUS FOR THE CONTINUOUS CARBONIZATION OF COAL.

The publication in the JOURNAL for July 16 last (p. 127) of an abstract of the specification of the patent taken out by Mr. Jas. Elliott, Engineer and Manager of the Ludlow Gas Company, for his apparatus for the continuous carbonization of coal, directed the attention of a number of gas engineers to this system. We have lately been courteously furnished by Mr. Elliott with enlarged drawings of his apparatus, as applied to a bench of five retorts at Ludlow; and from them the illustrations given below have been prepared. These, with the description accompanying them, will, we think, put our readers in possession of all the details of the arrangement. As the question of the supersession of retort-house labour by mechanical appliances is being seriously considered by gas managers, the publication of the following particulars will be specially opportune at the present time, supplementing as they do the account of M. Coze's and other systems of inclined retorts which appeared in our last issue. Mr. Elliott has been working incessantly during the past four years, at perfecting his process; and the result of its practical application has been to convince him that the work of the retort-house can be performed by machine attendants as by ordinary stokers.



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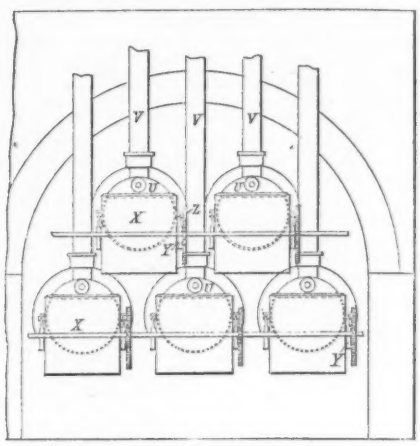

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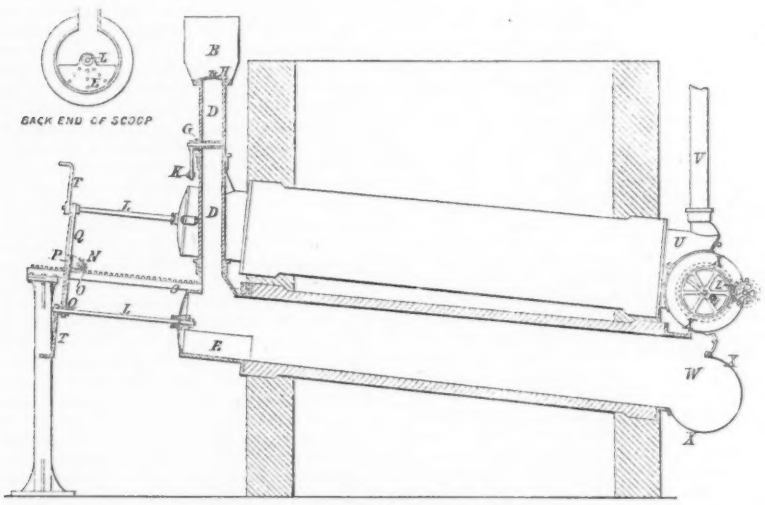


SECTION THROUGH CENTRE OF SETTING.

The retorts may be of the ordinary character, or they may be larger at the outlet end, so as to allow for the expansion of coke during the process of carbonization. B is a small open hopper for containing the coal. This hopper is connected to the mouthpiece of each retort by a pipe D, provided with an arrangement to prevent the escape of gas while the coal is being let into the scoops or chargers E, inserted in the mouthpieces. The arrangement for each pipe consists of a gas-tight cover F, working on a true surface fixed on the bottom of the hopper, and a coal-regulator G, consisting of a simple plate loosely fitting the interior of the pipe D. The covers F are connected by a rod H, so that on pulling the lever they simultaneously open or close all the pipes; or the covers may be moved by means of a screw. The regulators, which only require a quarter of a turn to open them full, may be opened separately by means of levers fixed on their axes; or they may be opened simultaneously by connecting the levers to a rod K. The scoops are each fitted to a rod L, passing through the lid of the retort, and having a lever T attached to the other end. The scoops are thrust into, or withdrawn simultaneously from, the retort by means of a cross-bar P, having as many arms Q as there are retorts in a setting. Each scoop-rod L passes through an opening near the extremity of its respective arm, so that on the shaft N being made to revolve, the pinions attached to the cross-bar will operate on the racks O, and cause the bar, and consequently the scoops, to advance or recede. To the opposite or back end of the retort, there is also a kind of mouthpiece U (called the "tailpiece"), from which the ascension-pipe V rises. The tailpiece is provided with a hand-hole for cleaning the pipe; also with an opening W, which corresponds with an opening in the short cylinder X, which is pivoted to arms attached to the tailpiece. The latter is made to a curve of a true circle; so that the cylinder, when brought up against it, may turn, though in close contact with the facings of the tailpiece, and ensure a gas-tight joint. The openings in the cylinders may be exposed for the discharge of coke by a handle attached to the axis of each cylinder; or the whole may be actuated simultaneously by means of the cogged wheels shown, fixed to a shaft, and geared into other toothed wheels Z attached to the cylinders. The bearings of the cylinders are mounted in slots in the arms, and are there supported by means of springs, which keep the cylinders in close contact with the tailpieces.

The action of the apparatus, which is very simple, is as follows:—The hopper being charged with coal, the covers are withdrawn from the tops of the pipes. The coal then falls till it fills the space between F and G, which, when full, contains a fixed quantity of coal. The covers are returned till they close the openings at the tops of the pipes, and the regulators opened, whereupon the coal will fall into the scoops below. The rods, and consequently the scoops, are then thrust in to their full length by the operation of the racks and pinions, and the scoops turned over by means of the levers. The coal will thus be deposited on the bottom of the retort, ready for carbonization. The rods are then drawn outwards, and the scoops returned to their former or normal position under the pipes. After a short interval, to allow the coke to become caked, the scoops are again charged with coal, thrust forward, and turned over. In thrusting forward the second charge of coal, that which has already been introduced will be pushed towards the opposite end of the retort; and by repeating the operation, the coal converted into coke will fall through the opening in the tailpiece into the cylinder. On the cylinder being turned by the means before described, the coke will

fall out, by the opening in it, into a barrow or other convenient receptacle. The coke will now be discharged at the same rate as coal is being introduced at the other end of the retort.

With reference to the results of the practical application of the system, Mr. Elliott says: "The apparatus has been continually at work at Ludlow during the past 18 months, and in the summer months has made all the gas required for the town. Each retort receives a charge of $\frac{3}{4}$ cwt. once every hour, or equal to 16 cwt. per 24 hours, with 10-feet retorts. The quantity of gas produced is 10,000 cubic feet of 16-candle power, using Talk-o'-the-Hill coal and no cannel. The coke comes out hard and bright, with very little breeze. The time occupied by one man in charging a bench of five retorts and turning the coke cylinders is two minutes. Thus one man would be able to take charge of at least 12 benches. No skilled labour is required, as any ordinary labourer, after being once shown, will have no difficulty in working the apparatus. When a number of benches are worked, power would be employed; the apparatus being geared to shafting running the entire length of the retort-house. With suitable machinery, I estimate that two attendants would be able to work at least 50 benches of retorts. The apparatus would be made to work automatically. After one bench has been charged, the apparatus at the next bench would be thrown into gear, and so on to the end of the retort-house. When this is reached, it will be time for the first bench to be charged again. The machinery is not complicated, and requires only five simple motions to complete the operation. Owing to the retorts not being opened to the air, and the coal being introduced in small quantities, there is a saving in fuel. The retort-house is not so unpleasant as is generally the case, as there is little smoke, and the coke does not require any quenching. With better heats and the retorts made a little larger at the outlet end, there would be no difficulty in carbonizing 20 cwt. of coal per mouthpiece per 24 hours. The reason of more coal being carbonized by this system is that it is moved at short intervals during its progress through the retort; thus allowing the gas to pass off more freely."

THE CONDUCT OF AN ELECTRIC LIGHT BUSINESS IN CONNECTION WITH THE GAS INDUSTRY.

By W. H. Pearson, of Toronto.

[A Paper read at the Annual Meeting of the American Gaslight Association in Baltimore, Oct. 17.]

The question of the desirability of a gas industry, in connection with the electric light business, being operated by the same company, is one regarding which there will naturally be considerable diversity of opinion, and one, indeed, upon which, I am free to admit, I have been induced to change my views. At the meeting of this Association two years ago, I strongly opposed gas companies having anything whatever to do with electric lighting. But further and fuller light upon the subject has caused me to think differently; and I have recently come to the conclusion that, on the whole, it would be advantageous for a gas company to manufacture and sell both kinds of lights. It will be my purpose, in this paper, to advocate that side of the question. In doing so, however, I must express my regret that, owing to the strange course taken by the Toronto City Corporation, in refusing the Consumers' Gas Company the right to use the streets for electric wiring, I am not in a position to speak from practical experience on electric lighting; but as doubtless there are gentlemen here who have had this experience, they will be able to supply information which I am unable to give.

The rapid progress which has been made in electric lighting during the past few years, and which is continually going on at an increased ratio, must, of itself, be conclusive evidence, to any unprejudiced mind, that it has "come to stay," and that, as at present, it is destined to continue to be one of the principal, though not, in my opinion, the chief lighting agent of the future. For, on careful investigation, I am satisfied that neither the arc nor the incandescent light can compete with good and cheap gas as the light for the people; and while there are some who can and will have luxuries, or what they consider to be the best, at any price, with the general public the question of cost is the factor which has the most weight.

Admitting that electric lighting is to be a permanent industry, and that it will have a wide field, and one that would otherwise be occupied by gas, why should not the two systems be conducted under one management? My first reason for claiming that they should be is that a gas company would be able to furnish the light more cheaply than an independent electric light company would in the same place. A gas company must have an executive head, who is usually a man of sound judgment and intelligence, with a good practical knowledge of the various mechanical and other appliances, including the economical production of steam, and having experience in the purchase of supplies and of the best markets in which to obtain them, and also having a large experience in dealing with the public. He is therefore, in these respects, better qualified to supervise the operation of an electric lighting business than a novice. The gas company being already organized and officered, the combination of electric with gas lighting would cause comparatively little or no additional expense for the directorate and management; and the two industries could therefore be much more economically conducted. Again, in most gas-works there is generally ample space in the grounds for a building, or, what is better, room in a suitable building already erected, in which to put up an electric light plant; nor will any additional office room be required. The saving in the interest on the cost of these buildings, therefore, would alone amount to a considerable sum; while the opportunity for the profitable utilization of some of the bye-products of the gas business would be another item of saving.

To my mind, the most important reason for a gas company going into the electric lighting business is to head off ruinous competition. We all know that, when seeking to obtain a foothold in a city, the first thing the promoters of an electric light company do is to canvas the gas consumers, and offer to supply them with their light—say, for a certain period—at the same price they have been paying for gas, and sometimes at almost any price. By this means, they often succeed in obtaining a large number of customers, who otherwise would not have adopted the electric light; and when, at the end of the term of agreement, the electric light companies are driven to increase their price to an amount that would pay a fair interest, the consumers, having gone to the expense of wiring and lamps, and disliking to have to "knuckle down" to the gas company, sometimes keep a number—if not the whole—of the lights, which otherwise they would not have retained. Now, if the gas company had had control of the lighting, they should not, and probably would not, have sold the light excepting at a fair profit, and to supply a legitimate demand; and consequently would have retained a number of their consumers, lost through this ruinous competition. Again, if the electric light business was in the hands of the gas companies, corporations would not put up electric lights in the reckless manner they do now, at three or four times the cost of gas, simply because the companies offering them are in opposition to the gas company, or because of the persistent importunity and the powerful influences brought to bear upon them by these opponents of gas. There would, therefore, be fewer electric lights and more gas-lamps; much cheaper, and at the same time quite as effective street lighting; and, consequently, the interests of both the citizens and the gas companies would be promoted.

The circumstances of a company will determine the relative degree of the importance to it of going into the electric lighting business. It is, of course, usually much more important for a small company to adopt electric lighting than for a large one, owing to the necessarily high prices charged for gas rendering electric lighting competition more injurious. Again, a gas company having full employment for all its plant, and contemplating extensions, will be in a much more favourable position to operate the electric light than one with ample space and apparatus for a much larger business, as, instead of extending the gas business, it could adopt electric lighting; while, in the latter case, the introduction of the electric lighting plant would continue to keep their superfluous gas plant without employment.

An important inquiry here presents itself: Would gas companies adopting electric lighting shut out all opposition? That would depend a great deal upon the financial strength of the company, and the manner in which it has conducted its dealings with the public. Few local electric light companies would be willing to "tackle" a gas company strong financially, provided the latter's prices for electric light are fair and reasonable, and it is prepared to supply every legitimate demand.

As opposition in lighting has proved to be productive of unnecessary and wasteful expenditure, and consequently detrimental both to the interests of the gas and electric light companies as well as to the public. I hold that the civic authorities should, with certain restrictions and safeguards, give the monopoly of the electric lighting, as well as the gas, to the first in the field; thereby securing to the citizens the cheapest light they can obtain, for, as experience has shown, ruinous competition has almost invariably resulted in combinations and increased prices, owing to the necessity of having to pay interest upon the large amount of unnecessary capital, and to make up for previous losses. I am afraid, however, that it will be a long time before corporations will learn this common-sense lesson.

I do not wish it to be inferred, from anything I have said, that I contemplate from the opposition of electric lighting anything approaching disaster to any fairly large and well-organized gas company, or to any company in a position to sell gas at a moderate price. Drawing my conclusions from what has already transpired, I am satisfied that, with regard to such companies, the worst that could happen would be a reduction in the ratio of increase in the business of the Company heretofore maintained, or the maintenance of the *status quo*. After a good deal of inquiry, I have yet to learn that any good-sized Company has failed to maintain at least the consumption of the previous year.

As the admirable report of the Board of Gas Commissioners for the State of Massachusetts for the year ending June 30, 1888, may not have been accessible to most members of this Association, some extracts and deductions from that report, in corroboration of my claims, will doubtless be of interest.* This report contains the statistics of 60 coal, and 10 water gas companies, and 48 electric light companies. Fifty of these coal gas companies show an average increase in the consumption over the preceding year of 12·68 per cent. For three there are no returns showing increase or decrease; and seven show a decrease in the consumption. Four of the oil gas companies show an average increase of 13·64 per cent.; for two there are no returns; and four show a decrease. There are electric light companies in 27 of the places where there are gas companies; and the average increased consumption shown

* Some interesting statistics from the report here referred to have been already given in the Journal (*ante*, pp. 496, 545); and others will be found in the article which appears elsewhere to-day.

for these gas companies is 11·85 per cent.—there being only two gas companies where there are opposition electric light companies that show a decrease in consumption. It is to be regretted that the increase or decrease in the electric light business is not given in the report referred to. Twenty-seven of the gas companies alluded to have during the year reduced the price of gas. These, however, are not the same 27 as were opposed by electric light companies. That in the aggregate these gas companies are doing a fairly paying business, and are in a sound financial position, is evident from the following facts: The dividends paid by 64 of them range from nothing to 20 per cent., and average 5·15 per cent. The report of the other six is not given. The aggregate surplus and reserve funds of these companies amount to 23 per cent. on the paid-up capital. With one exception, the companies not paying dividends are very small ones. The following statement will, to some extent, show the nature of the competition with which they have had to contend:—The average price charged per hour for a 16-candle incandescent electric light, for commercial lighting, in the cities of Boston, Cambridge, Lawrence, Lowell, Springfield, and Worcester, is 1·28c., which is equal to $2·56 per 1000 cubic feet for gas of the same illuminating power; while the average price charged for gas in these places is $1·48 per 1000 feet—the average price for nominal 2000-candle arc lights for municipal lighting all night being 55c. The average increase in the consumption of gas in these places, over the previous year, amounted to 9·47 per cent. These are fair samples of the electric lighting charges made throughout the State, where water power is not employed.

From the above statements, it appears evident that gas lighting is more than holding its own in Massachusetts (and I take it to be a fair illustration of the position of the industry throughout the United States), and that incandescent lighting cannot there, at all events in the larger cities, begin to compete with gas in prices. Whether or not electricity, at the prices charged in Massachusetts, is paying, does not appear, as there is no statement in the report referred to of dividends paid by electric light companies, as in the case of gas companies. This, of itself, is suspicious; and if fair dividends were paid, it is not likely that the fact would be suppressed.

While I am an advocate, for the reasons already given, of gas companies adopting the electric light, I should be sorry to have it understood that I yield to some of the claims to superiority made by the promoters of electric lighting. That it does not vitiate the atmosphere, throws out little heat, and does no injury to decorations, plate, &c., I am quite prepared to admit. But the vitiation of the atmosphere by properly purified gas is by no means so serious, nor so injurious to decorations, &c., as is sometimes claimed by its opponents; and while the electric light does not vitiate the atmosphere, it cannot be utilized in ventilation as gas can. The advantage or disadvantage of the heat thrown out by gas is really a matter to be determined by the kind of climate in which it is used. In the northern parts of the United States and in Canada, there are only two or three months in the year in which the heat of the weather causes any annoyance, while during the rest of the year the gas is found to be a positive advantage in supplementing the heating from other sources. As an illustration that this is recognized by gas consumers, one of our largest hotel keepers told me recently that it prevented his having to light his furnaces weeks earlier than he otherwise would; and this, he said, was one of the reasons why he did not care to put in the electric light. Only a few days since, another of our customers declined to adopt the electric light, because it would necessitate his putting a heater into his restaurant.

As to steadiness, we all know that a perfectly steady light can be obtained from gas by the use of proper globes and burners, and that gaslight is not subject to the deterioration which takes place in incandescent lights often after the lamps have only been in use for a few days, nor to the fluctuation in the candle power of the arc lights. Nor am I prepared to yield the palm to electricity for street lighting, as I am satisfied the streets can be as effectively, and in many places more economically, illuminated with gas. For instance, two high-power lamps, consuming from 20 to 25 cubic feet of gas per hour, placed 200 feet apart, though not yielding so brilliant an illumination around the lamp, will give more satisfactory lighting than so-called 2000-candle (actually from 400 to 500 candle power) arc lights placed 400 feet apart.

An important element to be considered is the question as to whether the cost of the production and the selling price of electric lighting can be materially reduced. Unfortunately, in discussing this point, not being an electrical expert, I am placed at a disadvantage; but I think we have some data to enable us to come to a fairly accurate conclusion. It is hardly likely that the high efficiency of the engines employed in many places—using (say) less than 3 lbs. of coal per horse power—can be much improved upon, or that the very low prices of carbons (now less than 1c. each) can be much reduced; while the introduction of the alternate system of incandescent lighting seems to have reduced to a minimum the cost of wiring. It is pretty generally admitted among electricians that a 2000-candle arc lamp requires 1-horse power; and 14 is about the highest number of 16-candle incandescent burners obtainable per horse power that I have known to be claimed. Whether better results than these can be obtained is a matter for consideration.

It does not therefore appear as if there could be any very important reduction made. Moreover, it is admitted that in numerous places the electric lighting business has not been a profitable one; and certainly higher prices will have to be charged in those places to put it upon a paying basis. At all events, as an off-set, as far as large cities are concerned, against the possible reduction in the cost of production, the probability that the authorities will require wires to be placed underground, which means about three times the cost of overhead wiring, must be taken into consideration. It must be admitted that the prices now charged by manufacturers for electrical apparatus are generally far too high; and doubtless a very material reduction will be made in the course of time, which will score in favour of electric lighting. The use of electric motors is, of course, a valuable adjunct to the business of incandescent electric lighting companies, and one which will doubtless increase, and therefore a factor to be taken into account. It must not be lost sight of, however, that most important reductions and savings are constantly being accomplished in the manufacture and distribution of gas, and that there is equal probability of their fully keeping pace with the reductions made in the cost of electric lighting.

A consideration of the prices paid for electric lighting throughout the United States generally will not be out of place; and this information is furnished by Whipple in his "Municipal Lighting." In this interesting volume, he gives a list of the prices charged for public lighting in 316 cities and towns in the States, where the streets are either wholly or partly illuminated by electricity, of which the following is a partial summary:—The highest price paid for an arc light of 2000 nominal candle power, burning all night, is $360; and the lowest, $40. Between these two extremes are 186 prices, a few of which I give—$280 per annum (56 lamps); $255 (100 lamps); $252 (44 lamps); $237·25 (704 lamps); $233·60 (25 lamps); $200 (170 lamps); $60 (100 lamps); $85 (65 lamps); $80 (14 lamps); $75 (33 lamps); $73 (20 lamps); $60 (55 lamps); $57·60 (75 lamps). The highest price charged for lamps burning till midnight is $273·73 per annum; the lowest, $47 per annum. The following are a few of the intermediate prices charged:—$196 (56 lamps); $182·50 (17 lamps); $146 (16 lamps); $75 (55 lamps); $75 (22 lamps); $60 (26 lamps); $50 (17 lamps). The difference between the highest and lowest prices charged for lamps burning all night is 482 per cent.; and between the highest and lowest for lamps burning till midnight, 386 per cent.

It is clear that no local conditions could legitimately cause anything like such a great variation in prices of electric lighting. It would seem as if electric light companies simply obtain the highest price they can get; that for the sake of "getting in" they would take any price; and that it is largely a matter of shrewdness on the part of the officials on both sides as to the amount paid. It is evident these highest and lowest prices cannot be maintained; and the question arises: When they come down to a fair average—say, $146 per annum, or 40c. per night—will there not be a reaction in a number of places in favour of gas lighting. Whipple gives the average cost for arc lighting as $121 per annum; but from information which I have, I think 40c. per night would be a fairly paying price where a large number of lamps are taken. I consider at that price high-power gas-lamps can come into successful competition, and give more satisfactory illumination. From careful inquiry and investigation, I am satisfied that, in the average place, incandescent lighting cannot be furnished to pay a moderate dividend at less than 1c. per hour for a 16-candle lamp, which is equal to gas at $2 per 1000 cubic feet. In the city of New York, I am informed that the Edison people are charging 1¼c. per hour, which is equal to gas at $2·40 per 1000 cubic feet; that they pay a dividend of 5 per cent.; and that their stock is quoted at $75 per $100. I also understand that in their down town station their business is not increasing.

In conclusion, I consider that if a gas company can obtain the control of electric lighting, by all means let them do so. But if they cannot, I do not think they have any very great cause for alarm or discouragement; for I am satisfied, as regards most places, that if proper attention is paid to the introduction of gas for heating, cooking, and motive power, the increase in consumption from these sources will more than compensate for the loss owing to the introduction of the electric light. As far as the manager is concerned, it need not personally be to him any source of regret; for, as a rule, there is quite enough in the gas business to occupy his energies to the fullest extent, and the wear and tear from it is quite sufficient, without the addition of that which must of necessity arise from the adoption of electric lighting.

Goring and Streatley Gas and Water Company, Limited.—In the Journal for July 9 last, we noticed the commencement of the works of this Company. We now learn that the erection of the gas-works, and the laying of the necessary mains being nearly completed, the Company commenced supplying gas to the district on the 26th ult. amidst general satisfaction; some of the tradesmen and others illuminating their premises with stars and jets. The price of gas is 5s. per 1000 cubic feet; and in order to extend its use for the various purposes to which it is now applied, the Directors have wisely offered to lay, free of expense to the consumers, all services up to, and including the fixing of the meters. The water-works are being pushed forward, and will later on supply by gravitation good potable water to the whole of the growing and beautiful district. Taken in conjunction with the advantages of a good gas supply, this should induce the inhabitants to support the enterprise, by investing their money in sound property at home for their own immediate benefit. We understand that the Secretary of the Company (Mr. W. H. Hardy, F.C.A.) is prepared to consider applications for the few shares which are still unallotted.

THE OPERATION AND CARE OF GASHOLDERS.

By Chas. L. Rowland,

Of the Continental Iron-Works, Brooklyn, N.Y.

[A paper read at the Annual Meeting of the American Gaslight Association in Baltimore, Oct. 17.]

Somewhat more than a century ago, when gases first began to attract the attention of scientific men, the gasometer or gasholder was invented by the great French chemist Lavoisier. Owing to this invention, the utility of gas for lighting purposes became practicable; for previously the only means for the storeage of gases had been bladders. The most ancient holders were square or rectangular in form, and designed as a measurer of gas for experimental purposes only, hence the term "gasometer." Gradually, however, as gas became a commercial article, and has finally proved itself the light of the nineteenth century, the gasometer developed into a reservoir for the mere storeage of gas; and, as now used, the simple name of "gasholder" is more appropriate.

In their early days, these holders were made in one section only, and operated in wooden tanks. In 1814, the English Government was strongly urged to restrict gas companies from constructing gasholders exceeding 6000 cubic feet capacity. Since then, however, the dimensions of holders have increased at a marvellous rate, especially during the last fifteen years; and nowhere are they built on so large or so grand a scale as in the same country where the restriction was sought. The necessity for increased storeage capacity at a low cost brought out the idea of building holders of more than one section, by the use of the hydraulic cup and seal. This method, commonly called the "telescopic system," has proved to be entirely successful, demonstrated as it is by the practical operation of the enormous three and four sectioned structures of the present day. Thus we now find gasholders consisting of two types —viz., the single lift and the telescopic; the latter type embracing all holders made in more than one section or lift, and distinguished as double, triple, and quadruple lifts.

One of the most essential features in the operation of a gasholder, whether single-lift or telescopic in character, is that it shall work up and down the guides with as little friction as possible, and without getting out of the level to any appreciable extent. Let us consider the gasholder as a vertical cylinder, and see why it should be unstable and liable to get more or less out of level—assuming the centre of gravity to be the pivotal point. If the cylinder has no top, its centre of gravity, assuming its sides to be of equal weight throughout, would be in the centre of its length or height; and it would, of course, be in equilibrium. Now we close the top end, and in so doing add as much or more weight at the top than we have at the sides; the result being that our cylinder is top-heavy, and would overturn unless supported and held in position. For instance, a gasholder of ordinary construction, 100 feet diameter and 10 feet height of section, would be quite out of proportion (the cylinder in this case being too short for its diameter), and would be quite unstable, as there would be about twice the weight in the roof that there is in the sides, and the centre of gravity would in consequence be very high, being close under the centre of the crown. Such a vessel would prove extremely troublesome; the natural consequence being that it would be ever ready to invert upon slight provocation.

The operation of a gasholder therefore depends largely on its proportions and structural character, a knowledge of which should be possessed by those who have the structure in charge, in order to know the cause of difficulties which may occur in its operation from time to time. It often happens that more pressure is required than the natural weight of the holder will give; and as avoirdupois is all that is needed to obtain the desired pressure, the first impulse is to load the roof. It may perhaps be the case that the holder is of shallow section, which is already overloaded at the top; and if its weight is to be increased, it should be added at or as near the bottom of the section as possible. When the necessity for this added pressure is imperative, it is sometimes unwisely decided to obtain it in the easiest manner; and, in consequence, the operation is often attended with disastrous results. I would, therefore, caution those in authority to look well into the matter before deciding how increased pressure shall be obtained. To the want of proper precaution under the above conditions may be ascribed the many instances where gas companies have sustained serious damage to, and in many cases the total loss of a holder.

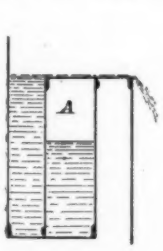


Fig. 1.

Fig. 2

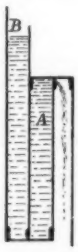


Fig. 3.

In all telescopic holders the hydraulic seal must be cared for. The old style of construction of the seal is shown in fig. 1. Although the cup rises from the tank filled with water, there is always with this form quite a loss of the seal, due to the fact that as soon as the gas pressure is exerted upon the inner portion of the cup, the water at A is depressed as many inches and fractions thereof as there is gas pressure; causing an equivalent amount of water to overflow (at B) the top of the section coupled, and thus greatly diminishing the depth of the seal. The more modern and improved method is shown in fig. 2. Although, as will be seen, the only difference in construction consists in carrying the dip sheet some 6 inches or more above the top of the dip, nevertheless it is an important feature, as it forms a dam which prevents the overflow and consequent loss; the water in the latter case being depressed equivalent to only one-half the pressure at A, and rising to the same extent at B, and confined by the dam—thus reducing the percentage of loss of seal one-half. There is also an important difference in the operation which is much in favour of the latter style. When the water accumulates from steaming the cup in the former method, it overflows the dip, and in cold weather forms large masses of ice on the side of the section; while the latter style will, if the dam be sufficiently high, simply confine the water while it rises at both A and B, and until the cup overflows at A, inside the holder, as in fig. 3, at which time the efficiency of the cup is complete.

To prevent the water in the cup freezing, steam-pipes should be carried up a portion of the height of the guide-framing, and connected with one or more jets in the cup by means of flexible steam-hose; the jets being located in the cup a few inches under the surface of the water, and supported in a horizontal position, so that the steam, upon being turned on, will cause the water to circulate completely round the holder. The cups are apt to be the receptacle for small stones and other missiles, especially when located near the public thoroughfare, and exposed to the mischievous small boy of the neighbourhood. They should occasionally be examined by feeling into them when they are near the surface of the water, and nearly high enough to engage with the next outer section.

I have frequently been asked if it is not well to lower the holder during high winds. At first thought, this would seem to be a very rational thing to do; and for a single-lift holder it would be quite proper. For telescope holders, however, it is not wise; the better way being to raise them till the outer section is cupped, for coupling the two sections or three, as the case may be, doubles or trebles the length of the cylinder—thereby lowering the centre of gravity, and otherwise causing greater stability. This increased stability, caused as it is by the additional length of the cylinder, more than compensates for the greater surface exposed to the force of wind. Of course, this action can be taken only when two or more holders are in use. The same method should be employed in caring for a holder in times of heavy falls of snow. During such storms the men should be employed in clearing the roof; the precaution being taken to equalize the working force, so that like parts of the roof will be cleared at the same time, keeping the holder as nearly as practicable in equilibrium. Care should be exercised to throw the snow well away, so that in falling it will not lodge in the cup or tank.

The main feature in the care of the tank is that the water should be kept up to the proper level, and stones and other solid matter prevented from falling in, which might in time be the cause of serious injury. The overflow should be frequently looked after, and kept free and clear.

Where the local conditions make it feasible, it is well, on general principles, to eliminate all counterweighting; but as specific statements under this head would open the door for considerable discussion, and as this feature may be considered as relating more properly to construction, I refrain from going into the matter in detail—simply stating that, where counterweights are in service, and it is desired to discontinue their use, it would be well to remove from the entire structure all the weights and counter gear.

All leaks, however small, should be promptly attended to as soon as detected. Let them be repaired by a competent man, and furthermore one who will not, as far as appearances are concerned, convert a new holder into an old one by injudiciously putting a patch here and another there, when all that is really needed is good judgment and the caulking tool.

No precise rules can be laid down for determining how often a gasholder should be painted, as some climates are much more severe in their effects upon the painting than others; it being necessary, in some localities, to paint the holders every year, while in others one good coat in two or three years will suffice. But when it is done, let it be thoroughly well done, and no half-work about it. The mere coating of the holder with the paint is the least part of the job, when the work is done as it should be. Before painting, the sheets should be carefully scraped, and all blisters and scales removed; leaving a good surface for the new coat to adhere to. If the painting is done without such previous preparation, the object sought—viz., the preservation of the structure—will not be attained. Undoubtedly the new coat of paint would greatly enhance the appearance of the holder; but oxidation and decay would be constantly doing their work under the cover of good looks.

Advance in the Price of Fire-Clay Goods.—At a meeting of fire-brick manufacturers, held at Stourbridge last Tuesday, it was unanimously agreed, in consequence of the increase in wages, to advance, on and after the 1st inst., the price of fire-bricks 5s. per 1000, cement clay 1s. per ton, gas-retorts 6d. per foot, and all other goods 10 per cent.

Register of Patents.

DESULPHURIZING THE LIME USED IN GAS PURIFIERS, AND RECOVERING THE SULPHUR THEREFROM.—Walker, W. T., of Highgate. No. 15,655; Oct. 30, 1888. [4d.]

The object of this invention is to desulphurize the lime which has been used in gas purifiers for the purification of coal gas, from sulphur or sulphur compounds, so as not only to do away with the present existing nuisance, but to recover the sulphur, and also obtain lime which after being revivified is fit to be used again in the purifiers.

The patentee proposes to introduce carbonic acid gas into the lime which has become charged with sulphur or sulphur compounds; thus displacing the sulphur compounds, which pass into any suitable appliance for receiving or recovering the sulphur—for example, into a gas-holder or direct into a condenser and scrubber—and thence into a "Claus" patent kiln, in which the sulphur is obtained and deposited. The process may be carried on with carbonic acid gas obtained from any convenient source; but it is generally preferred to use the carbonic acid gas which is driven off in revivifying the lime from carbonic acid gas. The sulphur may either be driven off as described, whilst the foul lime is in the purifier, or after it has been removed to suitable vessels for treatment.

When then the desulphurizing of the lime is to be effected whilst the lime is in the purifiers, these vessels are provided with an inlet pipe from the source of supply of carbonic acid gas, and an outlet pipe for the products of desulphurization; these pipes and the ordinary pipes for the inlet and outlet of the coal gas being provided with valves, so that when the lime has become foul, the coal gas inlet and outlet are closed, and the inlet for carbonic acid gas and the outlet for the products of the desulphurizing process are opened.

In practice it will be necessary to find by experiment, says the inventor, the time the desulphurizing process will take, and consequently the time during which the passing in of carbonic acid gas is to be continued so as to effect the desulphurizing of the lime, or such amount of desulphurizing as may be necessary.

WASHING AND SCRUBBING GAS.—Dowson, J. E. and A., of Great Queen Street, Westminster. No. 16,958; Nov. 21, 1888. [8d.]

This invention relates to a washer in which the gas is passed through water, and of a scrubber in which the gas is passed through sawdust or other filtering material.

The washer is a closed box divided by vertical partitions into two or more chambers, each kept charged with water up to a certain level. A special feature of the washer is that the water is introduced by or through the same pipe which carries the washed gas away from the washer. To carry the feed water into the chamber into which the gas first enters, a partition is arranged to cut off a small part of the side of the chamber next the outlet and any other intermediate chamber; and the portion so cut off is in communication with the first chamber—a trough carrying the water from the pipe into the channel whence it passes into the first chamber. After the water has passed into the first chamber, it overflows into the second one, either through the elbow pipe by which the gas passes from the one chamber to the other, or through an adjustable overflow pipe; and if there be more than two chambers, the water overflows from each chamber to the next in series, in like manner, until the last chamber is reached—the water overflowing from the last of the series of chambers by an adjustable overflow or waste-pipe. The gas inlet-pipe passes down into the first chamber, and is sealed by the water therein. The gas bubbles through the water, and is carried into the next chamber by the elbow pipe before referred to, the end of which is also sealed by the water in the second chamber; and the gas then bubbles up through the water in this chamber and passes thence to the outlet, or through other chambers in the same manner until the outlet is reached.

Fig. 1.

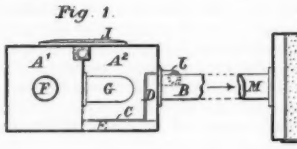


Fig. 4.

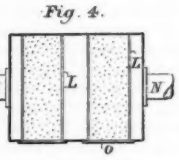
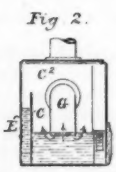


Fig. 2.



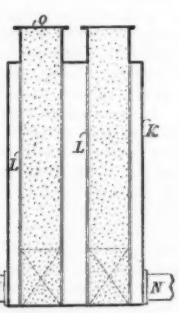


Fig. 3.

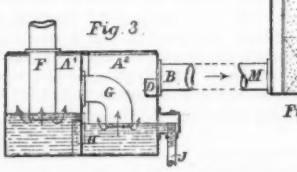


Fig 5.

The scrubber is constructed as follows:—In a suitable closed case are pairs of gratings or perforated partitions of any suitable material, but preferably of wood; the space between each pair being filled with sawdust or other suitable material for filtering the gas. The inlet is on one side of the scrubber, and the outlet on the other; so that the gas must pass through one or more walls of sawdust or other filtering material on its way from the inlet to the outlet. Above and below each of the filtering compartments are doors or moveable plates, through which the material may be inserted or removed.

The scrubber and washer may be employed separately or combined; the illustration showing how they would be connected in the latter case—figs. 1, 2, and 3 being views of the washer; and figs. 4 and 5, of the scrubber.

The washer has two chambers A^1 and A^2. F is the gas inlet pipe; G, the elbow pipe between the chambers; and B, the gas outlet pipe. D is the trough leading the water entering at or by the pipe B into the lateral chamber or passage-way E, by which the water passes to the first chamber. This passage-way is divided off from the chamber A^2 by the wall C. The water passes from the chamber A^1 to the chamber A^2 through the elbow-pipe G, or an adjustable overflow-pipe may be arranged for the purpose. Part of the wall separating the chambers is set back or forward, as the case may be, to form a horizontal portion at a suitable height above the floor of the washer not greater than the least depth of water desired; the upper face of this horizontal portion being in the chamber A^1, the other or lower face in the chamber A^2. Through this horizontal portion passes the vertical screw-threaded pipe H—open above and below, fixed if desired by a set-nut so that its upper rim is at the level desired for the water in the chamber A^1. To enable this pipe to be adjusted, a door I is made in the wall. The overflow waste-pipe J from the second or last chamber is similar in principle.

In cases when it is impossible, or not desirable, to allow the water to flow into the washer through the gas outlet pipe B, it may be carried by direct supply to the chamber A^1, and the passage-way E and trough D will then be dispensed with.

In the scrubber shown there are two pairs of perforated partitions L enclosed within the case. M is the inlet, N the outlet. These may be placed near the bottom, or at any desired position at the sides, or there may be more than one inlet and outlet. Their orifices into the scrubber are guarded by baffle-plates as a means for better distributing the gas. O are doors for emptying and cleaning the scrubber.

GAS-BURNERS.—Taylor, W., of Liverpool. No. 17,044; Nov. 23, 1888. [6d.]

This invention, relating particularly to ordinary ("Bray" and other like) burners, has for its object "to obtain, from a given quantity of gas passed through a burner of the above kind, a greater illuminating power than is obtained under the conditions in which these burners are usually used." The patentee proposes to employ in connection with any such ordinary burner, a short tube placed loosely over it, and so arranged that air is admitted at its lower part, in such a way as to become heated before being used to support combustion. The air thus travels in an annular film between the interior surface of the tube and the exterior surface of the burner proper.

IGNITING APPARATUS FOR GAS-ENGINES.—Crossley, F. W., and Anderson, F. H., of Openshaw, near Manchester. No. 17,413; Nov. 29, 1888. [8d.]

This invention refers to igniting apparatus for gas-engines, by making the port in the valve casing or cover by which the ignition-slide passage is put in communication with the heated igniting-tube or equivalent appliance, moveable, so that for starting the engine it can be shifted farther away from the slide-passage and thereby cause the ignition of the cylinder charge to be delayed. The arrangement of this moveable igniting port is such as to connect the moveable part carrying the port to the lever actuating the exhaust-valve cam, so that on shifting the cam by the lever for starting the engine, the port is automatically shifted away from the slide valve.

CONTROLLING THE SUPPLY OF GAS TO BURNERS.—Lowe, F., of Knighton No. 17,648; Dec. 4, 1888. [6d.]

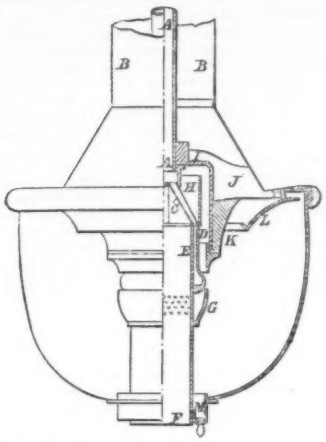
This invention relates to contrivances for controlling the supply of gas to burners, so as to regulate the flame to any height or to lower the supply of gas to the burners, or to totally put it out if necessary. The apparatus is particularly suited for railway stations and large warehouses, theatres, and other places of amusement where the gas lights run the entire length, or partly the length of the platform or room, and which are required at intervals to be turned down to a glimmer.

The object of the invention is to provide a contrivance that will attain these results either in a whole row of lights, or to a single bracket, that will enable anyone to lower the gas so that just a glimmer of light is left with certainty by the operator or person taking hold of a knob at the lower end of a spindle and pulling the spindle down. This causes a check-valve at the top of the spindle to close on to a valve-seating inserted in the upper arm of the casing. Thus, when the valve is shut down, a small quantity of gas passes by grooves or flutings cut in the spindle under the check-valve; but by pushing the spindle up, the valve opens and renders the flutings useless. The supply pipe thus receives the ordinary quantity of gas desired.

REGENERATIVE GAS-LAMPS.—Clark, A. W., of Glasgow. No. 17,814; Dec. 6, 1888. [8d.]

This invention relates to gas-lamps of the kind in which provision is made for heating the air supplied to the flame. The lamp may be used as a pendant with a descending gas-pipe and with an annular flame spreading beneath reflectors, or it may have a tulip-like flame extending outward and upward from the upwardly directed end of a gas-pipe.

The former modification is shown in the engraving. It consists of a gas-pipe A within an uptake tube B, for the products of combustion or flame-gases; while at its bottom end it communicates by a number of branches C, with an annular space between a short outer tube D and a larger inner tube E. The outer tube is bulged near its lower end; and the bulged part, forming the burner is pierced with small holes for the issue of the gas-jets. The tube E serves for the main air supply, which enters at its bottom end F (where a regulating-valve may be placed); and a projecting rim is provided to support the glass globe. The inner or air tube is perforated below the burner; and some of the air passes out into an annular deflector G, fixed on the outside of the tube E, to direct the air upon the under side of the flame. From the top of the air tube, the air passes between the gas supply branches C, and either through a perforated shell, or preferably over the top of an



unperforated cylindrical shell H into an annular cylindrical heating chamber, through which it descends to the upper side of the flame. This air-heating chamber I is formed in a metal piece J fixed to the gas-pipe, and has connected to it by radial arms the top of the lamp, which is in the shape of a conical enlargement of the lower end of the uptake tube B, for the flame-gases. At the lower end of the air-heating chamber, there is placed an inner annular reflector and heat-storer K (of asbestos), supported by a ring screwed to the bottom of I so that it can be withdrawn down over the burner when this inner reflector requires renewal. An outer asbestos reflector L is fixed to the framing of the lamp; and the flame-gases pass up between the two reflectors into the uptake, and by acting on the outside of the shell of the air-heating chamber, cause the air to be considerably heated on its way through that chamber, to the upper side of the flame. A little air is, by preference, admitted between the outer reflector and the ring fitting on the top edge of the globe. A small opening and a covering slide M are provided outside of the bottom of the air tube E for introducing a taper so as to light the gas.

INCANDESCING ELEMENTS FOR GAS-BURNERS.—Harris, C. B., of New York. No. 13,129; Aug. 20, 1889. [8d.]

This invention relates to that class of gas-burners in which hydrogen or water gas is burned to render incandescent an element or body of material hung in the flame. Usually the incandescing element of such burners, says the patentee, has been composed of filaments, or fine threads, or pencils formed by expressing the compound of which they are composed through suitable dies. The material employed for the purpose may be varied; a large number of refractory substances or earths being suitable for the purpose—such, for instance, as magnesia, zircona, strontia, &c. In their preparation, they are mixed with some vehicle which gives the compound the capacity of being formed into the required shapes; for instance it is common to employ a mixture of starch and magnesia in making incandescing pencils, and also a mixture of magnesia and glue, either with or without starch, for the same purpose, and also for making threads or filaments which may be wrought into the desired shape. Afterwards they are burned, and are then ready for use. In burners in which pendant pencils are hung in the flame, the pencils are each separately formed, and are held in a head with cement, preferably of the same material. This is a difficult operation; since the pencils are delicate, and breakage is considerable. Where the thread or filament is formed through a die, it must be wrought into the shape required and then burned; the method of operation requiring care and considerable time.

The present invention embraces a method for making incandescing elements unlike either of those mentioned; consisting, generally speaking, in forming the compound into a sheet of the thinness and delicacy required, and then cutting out, perforating, or slitting the sheet so as to obtain the shape or pattern desired. In practising the invention, the patentee preferably mixes with the refractory material a portion of glue or like substance, as above suggested, so as to give the compound toughness and flexibility. He then forms it into sheets, preferably by passing it between rolls; and from the sheet thus formed blanks are made, and then cut, slit, perforated or otherwise formed into the desired pattern. Afterwards the element is burned, and is then ready for use.

APPLICATIONS FOR LETTERS PATENT.

16,575.—BALLER, E., "An improved gas burner or regulator." Oct. 21.

16,603.—MASCHINENBAU-ANSTALT HUMBOLDT, "Improvements in machinery for breaking, screening, and sorting coal, coke, and other materials." Oct. 21.

16,646.—KNAPP, D. H., "Improvements in the manufacture of gas." Oct. 22.

16,724.—KELLY, A. and A., "An Improvement for a gas-burner—title, Inextinguishable gas-burner, light not going out when turned off." Oct. 23.

16,674.—COLLINGRIDGE, A., "An improved boiler furnace, and apparatus connected therewith, for the generation of heat by the use of hydrogen gas or (water gas) as fuel." Oct. 24.

16,795.—DIXON, D., "Improvements in the methods of generating gas for heating and other purposes, and in the apparatus used therefor." Oct. 24.

16,889.—BOWER, G., "Means or apparatus for carburetting air or gas." Oct. 24.

16,946.—BARNETT, C., "An improved wheel motor for steam, gas, air, or water." Oct. 26.

Legal Intelligence.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

SATURDAY, NOV. 2.

(*Before Mr. Justice* STIRLING.)

WINDING UP OF THE DUNEDIN GAS COMPANY, LIMITED.

Mr. BRADFORD said this was a petition for winding up the Company, which was formed in May, 1884, with a capital of £100,000, to take over certain gas-works in the neighbourhood of Dunedin. The petition set out the fact that a sum of £30,000 was raised on debentures, and that from time to time the Company had been in financial difficulties; the interest on the debentures being in arrear for a year and a half. In August last, a Receiver and Manager of the Company was appointed. Since the presentation of the petition, a meeting had been held for the purpose of passing the ordinary resolution to wind up; but this was not done. The petitioner was a creditor for £90.

Mr. BRAMWELL DAVIS appeared for the Company, but did not oppose the petition. He said it was probable that a scheme of reconstruction would be adopted.

Justice STIRLING made the usual order for winding up.

WESTMINSTER COUNTY COURT.—WEDNESDAY, OCT. 30.

(*Before Mr.* F. BAYLEY, *Judge.*)

INCANDESCENT GAS-LIGHT COMPANY, LIMITED *v.* COX.

This was an action brought to recover £6 2s. 6d. for gas-lamps supplied to the defendant by the plaintiffs. The goods were delivered between the dates of October, 1887, and May, 1888, but had never been paid for.

Mr. *R. Carlin*, the Company's Accountant, proved that the goods were ordered by defendant, and duly delivered to him; and why he had refused to pay for them, he (witness) was at a loss to know.

Mr. COLLINSON, who appeared for the defendant, said it would be admitted that the goods were delivered; but the reason his client declined to pay was that the lamps were not in accordance with the description given of them in the Company's prospectus, inasmuch as they were said to effect a considerable saving in the consumption of gas, whereas it was found that they consumed nearly double the quantity.

In cross-examination, witness admitted that the Company sometimes had the lamps returned to them in consequence of their failing to give satisfaction; but he should say the fault arose from the ignorance of the persons who sent them back, and not from any defect in the lamps themselves. If the lamps were properly used, they effected a very considerable saving of gas.

Defendant was then called, and admitted having had the lamps in question; but said they were absolutely useless to him, and in no way corresponded with the description given of them in the Company's prospectus. He had fitted up the lamps in a house at Kilburn; but they were so unsatisfactory that he had to replace them with others at his own expense, in addition to which he had lost a good customer on account of the lamps, besides being out of pocket to the extent of £6 10s.

His HONOUR said there was absolutely no defence to the action. There was no evidence whatever to show that the lamps were not equal to the description given of them; and therefore judgment would be for the plaintiffs for the amount claimed.

ROBINSON AND FISHER *v.* LAIRD.

In this case the plaintiffs are the owners of some house property at Hammersmith, known as the St. Peter's Estate, and the action was brought against the defendant to recover payment for the supply of water from an artesian well. It appeared from the evidence of the plaintiffs' representative that for many years the houses on the estate have been supplied with water from the well in question, and there was a clause in the original lease which provided that certain charges should be made for such supply. Until recently the charge had been £1 per annum; but it had been found necessary to increase the rate to £1 10s. Unfortunately, a number of poor tenants had managed to get into the houses, and now they refused to pay for the water, which they used very liberally.

Edward Miller, a clerk in the plaintiffs' employ, having deposed to the facts,

The SOLICITOR for the defendant said before the plaintiffs could claim a penny of his client, they must show, by a contract or otherwise, that he had agreed to pay the money.

His HONOUR (to plaintiffs' representative): Have you any contract or undertaking?

Witness: No; but I will hand in the original lease which provides for the payment.

His HONOUR, having examined the document, remarked that the property appeared to have been mortgaged to somebody, and asked if any transfer could be produced to show the plaintiffs' title, as they were certainly not parties to the document before him.

Witness said he had no other documentary evidence, except the book showing the payment of the rate by the various tenants, and the defendant had always paid up till August of last year.

His HONOUR said there was no evidence to prove that the defendant was liable for this money, and therefore he should direct a nonsuit, with costs.

There were several other cases in which the plaintiffs sought to recover under similar circumstances. His Honour, however, without hearing any evidence, directed them to be struck out of the list.

THE PRICE OF GAS IN THE OUT-TOWNSHIPS OF SALFORD.—A conference of representatives of local authorities within the area which is supplied with gas by the Salford Corporation, was held last Tuesday, at Manchester, to consider the price at present charged by the Corporation for gas in the outside districts. Mr. R. Spary, the Chairman of the Barton Local Board, presided, and Mr. Trenbath, Clerk to the Board, acted as Secretary. Attention was called to the Gas-Works Clauses Acts of 1847 and 1871; and it was stated that the former measure provided that the price of gas should be settled by agreement, and in case of any difference, by arbitration, while the latter provided that all difference whatever which arose between the Gas Committee and any local authority in relation to the supply or consumption of gas should be settled by arbitration. In view of these facts and of Counsel's opinion, the following resolution was agreed to:—"That this conference do form a deputation to the Salford Gas Committee at the earliest possible date, to ask for the abolition of the differential rate charged upon the out-districts of supply." The Secretary (Mr. Trenbath) was requested to communicate at once with the Salford Corporation Gas Committee for the purpose of arranging for an interview.

Miscellaneous News.

GAS WORKMEN AND THE LABOUR QUESTION.

The carbonizers and general workmen of the Sheffield United Gaslight Company have framed what they describe as "a fair scale of work and wages," and have submitted it to the Directors—requesting a reply to it in the course of this week. The stokers at the Neepsend and Effingham Street works place 72 as the number of retorts to be charged and drawn; the quantity of coal to remain as it is; wages to be 5s. 6d. per day, 1s. 6d. per week "good-time" money, time-and-a-half for Sunday, double time for Christmas Day and Good Friday; and one week's holiday (with pay) for permanent men. The firemen at both works are willing to look after nine fires and clean six at 5s. per day. The coal fillers desire 4s. 6d. per day for 16 loads in the old retort-houses and 10 loads in the new house at the Effingham Street station. The coke wheelers require 4s. 3d. per day. The firemen, coal fillers, and coke wheelers make the same demands as the stokers in regard to additional pay. The purifying men desire to be paid £1 5s. per week of 54 hours, time-and-a-quarter overtime, and time-and-a-half for Sunday. The boiler-men require a reduction of the hours of labour to eight, at the same rate of wages as now, time-and-a-half for Sunday, and double time for Christmas Day and Good Friday. The fitters and smiths ask for 6d. per day advance, time-and-a-half for the first two hours' overtime, and double time after. The brick labourers and the men on the coal bank demand 4s. a day, with 54 hours' labour per week, with time-and-a-half overtime. The general labourers ask to be paid £1 3s. per week of 54 hours, time-and-a-half overtime, and double time Christmas Day and Good Friday; all contract work to be abolished, seeing that the men do not have the same chance as the men employed by the Company with regard to wages and time. The street-men, pipe layers, and repairers likewise want £1 3s. per week of 54 hours. The men also desire that Sunday work shall be abolished whenever possible; and they ask for suitable rooms in which to have their meals, and for bathing and dressing purposes.

At a meeting held on the 27th ult. to congratulate the Birmingham gas stokers on the success of their recent application to the Gas Committee for improved conditions of work, Mr. Grainger, a member of the Corporation, moved the following resolution:—"That the gas workers in the employment of the Birmingham Corporation desire to thank the members of the Gas Committee for the generous manner in which they have met the request of the men contained in the memorial lately sent in to them." He said his dealings with the Committee during the last few years had been more lively than pleasant; and he was glad, therefore, on this occasion to recognize the generous way in which they had met the request of the workmen. He hoped the relations between the Committee, the Superintendents, and the workmen would be as amicable in the future as they now were.

Last Wednesday, the Directors of the Newcastle and Gateshead Gas Company intimated to a deputation of the workmen that, in response to their application (as set forth in the JOURNAL last week), they were prepared to grant an immediate advance of 10 per cent. all round, and to adopt the eight-hour shift early in the spring. A meeting of one section of the men was held in the evening, and one of the night-shift men on the following morning, to consider the Directors' proposals. It was generally thought to be too long to wait until the spring of next year to arrange for the introduction of eight-hour shifts, as requested; and it was urged that the arrangements should be proceeded with at once. After some conversation, it was decided to give notice to the effect that if at the end of 14 days their request was not complied with, they would cease work. Later in the day, a deputation waited upon the Secretary of the Company (Mr. W. Hardie) for the purpose of informing the Directors of the result of the meetings of the men. Mr. Hardie remarked that the deputation had better go back and reconsider their decision. It was difficult for the Company to undertake to make the proposed alteration at the present time, and that some period must elapse—longer than the men seemed to think—before such a change could be effected. The deputation intimated that they would further consider the matter. Mr. Hardie added that the Directors would hold another meeting on the following morning, and expressed the hope that the decision to be arrived at would be satisfactory to both parties. On Friday another deputation from the men attended at the Company's offices to confer with the Directors on their proposals. After a discussion extending over two hours, the following agreement was come to:—(1) That the shift of stokers be reduced to eight hours, as from Jan. 1, 1890. (2) That the same rate of wages be paid for eight hours as is paid at present for twelve hours. (3) That until the eight-hour shift comes into operation, an advance of 10 per cent. be paid upon the existing rate of wages to the stokers. (4) That all other minor matters be entered upon and determined on or previously to the eight-hour shift being adopted. It has been explained, in connection with this agreement, that those labourers who will not participate in the eight-hour settlement will retain the 10 per cent. in wages conceded by the Directors. The stokers, who will be paid 10 per cent. advance for the present, will cease to receive this advance when their hours are reduced from twelve to eight in January; but for eight hours they will continue to be paid the same wages they at present receive for twelve hours; with 1s. 6d. "good-time" money. In the evening the men held a meeting, and testified their pleasure at the result of the agitation.

A similar agitation is on foot among the men employed by the South Shields Gas Company, who have memorialized the Directors to be placed on the same footing, as regards hours, &c., as their brethren in other towns where changes have recently been made in the conditions of labour in gas-works.

At Darlington the gas stokers have been for some time dissatisfied with their wages, and, having failed to induce the Gas Committee of the Corporation to grant an advance of more than 1s. per week when 2s. was asked, are making an appeal to the public with a view to obtaining sympathy or putting pressure on the Council. They ask for extra pay for Sundays; but intimate that they will not press this point if they get the 2s. advance they ask for.

Reference has been already made (*ante*, p. 794) to the movement among the Leeds gas stokers and other workmen with reference to their hours of labour, &c. Last Tuesday a deputation from the men had an interview with the Gas Committee on the subject, when a statement was presented to them embodying the Committee's proposals and the concessions they were prepared to make. They were as follows:—(1) That eight-hour shifts be conceded. (2) That time-and-a-half for the two Sunday shifts, from 6 a.m. to 10 p.m., be also conceded, and double pay for Christmas Day and Good Friday for the same two shifts (if worked), conditionally on each man putting in a full week afterwards, and that payment of such double pay be deferred till the first pay day after that fact has been ascertained. (3) That one week's holiday be allowed to all men, such as stokers, firemen, and coal wheelers, who have been employed continuously for twelve months; and that each man be paid 25s. for such holiday week. (4) That the present pay (3s. 4d. per day) for yard-men is considered insufficient, and shall be advanced 3d. per day. (5) That the pay for purifiers be advanced to 4s. per day, with time-and-a-quarter allowance for Sunday (if working) or for overtime. (6) That the demand for separate firemen be conceded (wages 5s. per day), but that they look after nine fires and clinker nine, and do everything that is necessary in connection with them. (7) That the stokers, when working at settings of five, draw and charge 30 retorts per shift, carbonizing 75 cwt. = 2½ cwt. per charge. (8) That coal wheelers be paid 4s. per day, and for the settings of five, to wheel coal for 50 retorts twice each shift = 12 tons 10 cwt. As to New Wortley: (9) That stokers, when working at settings of six, eight, and nine, draw and charge 24 retorts, carbonizing 3 tons 12 cwt. per shift, or 3 cwt. per charge. (10) That the firemen on the settings of six look after and clinker eight fires, and on the settings of eight and nine look after and clinker six fires; and in each case do all that is necessary in connection with them. (11) That the coal trimmers on the settings of six and eight trim coal for 48 retorts = 14 tons 8 cwt., and on the settings of nine, for 54 retorts = 16 tons 4 cwt.; in each case twice in each shift. (12) Regulations as to the quenching and wheeling out of coke, the luting of lids, and other minor points, to remain as at present. The effect of the Committee's terms would be to reduce the hours of the stokers from about eleven to eight per day; to increase the wages of the yard-men by 1s. 6d. per week, and those of the purifiers by 2s. per week; also to make extra payment for Sunday and holiday labour. A long discussion took place; and the deputation retired with the understanding that the Committee's terms would be submitted to the rest of the workmen. This was done at a meeting held in the evening; when the general feeling was that they should be refused. The stokers asked the Committee to take off two fires; and the Committee have complied with the request, but propose to add ten extra retorts per man, so that each would have to draw and charge 30 instead of 20 retorts. The men all gave a fortnight's notice last Tuesday. A deputation from the men waited upon the Committee last Thursday, and stated that they had decided to reject the offers made to them, and to adhere to their original demands, which mean an increase of 40 per cent. in wages, as compared with 20 per cent. offered by the Committee. It was resolved to adjourn for a day; and in the meantime to prepare a statement setting forth the position of affairs for submission to the public through the press. This was done; the amended proposals appearing on Saturday In them the number of fires was reduced to eight; the number of retorts to 25 in settings of five, and to 21 in settings of six, eight, and nine; the firemen at New Wortley to look after six fires, and the coal trimmers to take 46 retorts. The Committee consider these proposals perfectly fair and reasonable as compared with similar work in other towns.

With regard to the agitation in Manchester and Salford, the demands of the men in the employ of the Corporation of the latter town were considered at a special meeting of the Gas Committee on Monday evening last week, at which several representatives of the men were present, and were informed of the concessions the Committee were willing to make. They included the granting of the eight-hour shift to all men engaged in the retort-houses; making six charges in the eight hours, as against seven in twelve hours; the hand-stokers at the Bloom Street and Liverpool Street works to carbonize 40 cwt. of coal per shift, and to wheel their own coal and coke; the same class of hands at the Regent Road establishment to carbonize 60 cwt., and wheel their own coke only; the yard-men and other labourers to have an increase of 4d. per day in wages; the engine and boiler men to continue working the same hours as now, but with an increase in wages equal to 10 per cent.; and time-and-a-quarter on week days and time-and-a-half on Sundays in respect of overtime—the demand in relation to this point being for time-and-a-half all round. These concessions practically include all the changes asked for by the men. Therefore, so far as Salford is concerned, the agitation may be said to be at an end. The Manchester Gas Committee, who had consulted with the Salford Committee on the labour question, agreed to practically similar terms in respect of their men, who last Wednesday met the Managers of the different stations, and signified their satisfaction with the concessions made, whereby they have gained all the points for which they have been agitating. The question of money for overtime and Sunday labour and other details arising out of the new system, which will come into force at once, were arranged without difficulty.

A memorial has been presented to the Gas Committee of the Halifax Corporation, by the men employed at the works, setting out the changes they wish for in their duties.

The agitation among gas workmen has reached Stockport. At a meeting of the Gas Committee of the Corporation held last Wednesday evening, a communication was read from the stokers and barrow-men employed at the Corporation Gas-Works—numbering between 60 and 70—with reference to their pay. It was stated that the wages paid were lower than in other towns, while the hours worked were very long. Under these circumstances, the stokers applied for an increase of wages from 32s. to 35s., and the barrow-men from 24s. to 26s. The communication closed with the ultimatum that unless the increases were acceded to the whole of the staff would give a week's notice from the following Friday. After some discussion, it was unanimously resolved to accede to the demands.

In connection with the paragraph in the foregoing article in which are recorded the final stages of the agitation in Manchester and Salford, the following brief statement, by a correspondent residing in the former city, of the way in which the movement was initiated and brought to its culminating point, will doubtless be read with interest by all gas officials who have recently had the "labour question" more or less pleasantly brought under their consideration:—Up to the beginning of September all was calm and quiet in the Manchester works. The men were not known to have a grievance; and they and the Managers were on good terms. The Gas-Committee had always treated the men in a friendly and considerate manner. On Sunday, Sept. 8, a mass meeting—called by circular distributed amongst the workmen, and placards posted on the walls; presided over by Mr. G. Evans, of Salford, and addressed (among others) by Mr. W. Thorne, of London—was held in Stevenson Square. At this meeting the usual Socialist doctrines were enunciated, and the wildest and most outrageous statements made. Amongst other things, the men were told to demand, and by united action obtain, what they wanted. As a last resource they could, it was intimated, put the city in darkness in a few hours; and those who resisted their demands, whether Councillors or Managers, would be marked men. As the result of this meeting, branches and sub-branches of the "National Union" were formed. A few weeks afterwards, a singular document, bearing neither signature nor date, was handed in to the Managers of the works. Some of the demands made did not apply to the Manchester works at all; while others were so vaguely expressed that they could not be understood. However, by intercourse with the men and inquiries made, it soon became clear what the men wanted, and what they were determined to have, or to go on strike. The *sine quâ non* of the position was eight-hour instead of twelve-hour shifts in the carbonizing departments at all the works, for machine and hand stoking alike. Various suggestions and offers were

made—increase of wages to machine men (5 or 10 per cent) with less working hours to hand stokers—but all proposals which did not include eight-hour shifts were alike rejected; and a general strike more than once seemed inevitable. At length all appeared to be fully arranged, and the men had obtained nearly all they asked for. The Gas Committee then said there were little details of work which could not be settled all at once if these new arrangements were to work smoothly; and they would take (say) 14 days to work them out, and adopt the best plans. "Not so," said the men; "we must have everything settled before we go to work on [last] Thursday night, or we will not go to work at all." And thus it was that the men commenced at once working under the new system. In the carbonizing department they have eight-hour shifts instead of twelve, at the same rate of wages per day. Yard-men and general labourers 54½ instead of 56½ hours per week, at 22s. instead of 20s. as before. All workers are to be allowed time-and-a-half on Sundays; and other pay for overtime remains much the same. The quantity of coal to be carbonized varies with the varying condition and structure of each station; and at one of the works with the different machines in operation in each of the four retort-houses. The result of all this is that the men have obtained nearly all they have demanded—possibly more than will care to keep, and certainly more than will be good for them. It is difficult to say at what cost these concessions have been made; but it will certainly be not less than £15,000, and it may be fully £20,000 a year. There are a few obvious lessons to be drawn from this agitation which it may be useful to emphasize. In the first place, managers should be prepared, by having ample storeage capacity and manufacturing power, to meet an emergency of this sort. Next, while securing, as far as possible, the good will of the men, such measures should be adopted as will render managers less dependent upon them than they now generally are. Finally, gas committees and boards of directors should be careful not to let any division among themselves be apparent to the men; and, above all, they ought to put entire confidence in the managers in dealing with the *employés*.

THE SALFORD CORPORATION AND THE HUNTER COMPACT.

On Monday evening last week, a public meeting was held in the Salford Town Hall to consider the action of the Corporation in regard to "the settlement known as the Hunter compact," and to take steps to bring about a Government inquiry. The hall was crowded; the larger part of the audience being working men. Mr. J. Thompson was elected to take the chair. In his opening remarks, he said the meeting had been convened to review the policy of the Corporation in respect to the settlement of the civil actions against Hunter, but he wished they had met for the purpose of sifting every department. He wanted to know how it was they had been robbed; and said there was a looseness somewhere in the management of the Gas Department. There was a majority in the Council opposed to a thorough inquiry; and they had brought upon their shoulders a large amount of suspicion. Mr. J. G. Mandley (who signed the circular calling the meeting) moved the first resolution—"That in the opinion of this meeting the agreement entered into by the Corporation with the convict Samuel Hunter to compromise the just claims of the Corporation for restitution by him and his confederates of the numerous and in many cases enormous bribes given in respect to contracts relating to the Gas Department of this borough, is wrong in principle and derogatory to the dignity of the borough, and extremely adverse to the securing of purity in the administration of municipal affairs. That in view of the confession made by the Consultative Committee of the Council of their inability to prosecute to a successful issue the claims of the Corporation as aforesaid, this meeting resolves that a petition be forwarded to Parliament praying for a Commission to inquire into the alleged fraudulent transactions and malpractices in connection with the gas and any other department of the Corporation—such Commission to have the usual powers to compel the attendance of witnesses and of the persons incriminated or suspected of illegal dealings, to take evidence on oath, and to call for the production of all books and papers that may relate to such inquiry." Mr. Mandley proceeded to give an outline of the history of the frauds. When, he said, Hunter first went to Salford, he found himself in the hands of "a pliant, nay, an adulatory Committee." The result was that large sums of money were voted for improvements in the gas-works; and, if he recollected aright, Mr. Hunter made on them something more than his salary. The compact which had been concluded with the convict would not hold good in law, because it was a distinct violation of the "anti-bribery resolution" which was passed by the Council in October, 1880, at his instigation. The resolution provided that proceedings should be taken against each and every person who had been guilty of bribery in connection with the contracts of the Corporation. In the Council, he asserted, he had been systematically thwarted, because the objects at which he had been aiming were unpalatable. Would the ratepayers of Salford, for this paltry consideration of £10,000, consent to barter away the honour of the borough? Were they satisfied to allow this rotten state of things to continue? ("No.") If that was their answer, he asked them to disregard the £10,000 concerned in the compact which had been concluded with Hunter, and appeal to Parliament to appoint a Commission to investigate these matters. Mr. Sharrocks, in seconding the resolution, said there was no doubt whatever that it could be proved that during the last 25 years the same quantity of gas in Salford had cost a quarter of a million sterling more than it would have cost in Manchester. Suppose that £10,000 a year had been placed aside for the reduction of the Salford debt, he ventured to assert that the debt of £450,000 would have been wiped of; and they would have had the Gas Department free from debt. The resolution was carried with only four dissentients; and a vote of thanks to the Chairman concluded the proceedings.

Sale of Shares in the Halstead Gas Company.—In accordance with the announcement in our advertisement columns a fortnight ago, Messrs. Bentall and Son sold last Tuesday at the Town Hall, Halstead, 315 fully paid £10 shares in the Halstead Gas Company, Limited. Considerable interest was manifested in the sale; the shares to be disposed of being about one-third of the entire stock of the Company. There was consequently a large attendance of bidders, and the competition was very keen. The following were the prices realized:—255 shares, £10 12s. 6d. each; and 60 shares, £10 10s. each—the total amount produced by the sale being £3339 7s. 6d.

Liversedge Water Supply.—At the meeting of the Liversedge Local Board yesterday week, a letter was read from the Bradford Corporation, stating that they were prepared to supply Liversedge with water from the high-level source—the Board taking it at a certain point for distribution—on the same terms as to other out-townships, and to enter into an agreement for a term of years. Liversedge is obtaining its present supply from the authorities of Cleckheaton and Gomersal at the extremities of their respective districts; and these places are supplied in the first instance from Bradford. What is described as an acrimonious debate followed the reading of the letter; and the question was further adjourned to the next meeting.

LANCASTER CORPORATION GAS SUPPLY.

Increase in Gas Consumption—Additional Storeage Room Required.

At the Monthly Meeting of the Lancaster Town Council last Wednesday—the Mayor (Mr. Alderman Blades) presiding,

Alderman Hatch, in moving the confirmation of the proceedings of the Gas Committee, said that their operations had been far more extensive than for a long time past. The Committee had had for some time under consideration a plan for telescoping one of the gasholders. Some years ago they had a gasholder erected with a capacity of 404,000 cubic feet, and it cost £10,132. Since then their requirements had become very much larger; and the Committee found that, unless something was promptly done, they would not be able to supply the gas needed by the consumers. To a great many houses new service-pipes were being laid; and in others the use of gas for cooking and heating purposes was increasing to such an extent that the Committee had come to the conclusion that they ought not to allow any further delay before doing something to meet the growing demand. They had inserted advertisements requesting tenders to be sent in as early as possible for enlarging the holder; and he had to ask the Council to give their sanction to the work being proceeded with as soon as the estimates were obtained. By the additions proposed to be made, they would have practically three gasholders, capable together of containing 1,447,000 cubic feet of gas; the two extra holders giving them an additional supply of 743,000 cubic feet.

Mr. Watson, in seconding the motion, said it might interest the members of the Council to know that it was nine years since the gas undertaking became the property of the Corporation. At that time the works were producing about 50 million cubic feet of gas per annum, whilst during the present year not less than 100 million cubic feet would be supplied to the consumers. The investment on capital account had never been increased; and it was not the intention of the Gas Committee to increase it, but to carry the cost of the work proposed over a period of two or three years, and pay it out of revenue.

Sir Thomas Storey remarked that he was glad to hear that this large expenditure, which might have become a capital charge, was going to be met out of revenue. He thought this was very important, because it had always seemed to him that sooner or later the gas-works might be put in danger by the introduction of other lighting medium. Since the Committee had had the management of the gas-works, he must say they had carried on the concern in an admirable manner; nevertheless, it had always appeared to him that it would have been wiser if they had not reduced the price of gas to the present very low point, and if they had provided against what might possibly be a depreciation of property in the event of electricity being more generally introduced.

The Mayor said he somewhat differed from Sir T. Storey upon the question of the reduction of the price of gas. He was somewhat startled by a statement made recently by Mr. Kitchen, that something like one-fourth of the inhabitants were using lamps instead of gas. He had since ascertained that Mr. Kitchen was within the mark; and that the reason given for so many people burning lamps was that they could do so at a much less cost than by using gas. Although he himself was friendly to electric lighting, he thought the Committee had done wisely in reducing the price of gas.

Mr. Kitchen observed that no doubt the Committee had aimed at a conclusion that additional gasholder accommodation was necessary; but at the same time, there was one feature which ought not to be lost sight of, and that was that they were about to make application for the use of electricity for public lighting, but to reserve its use in their own hands. He agreed with Mr. Watson that it was not advisable to take the cost out of capital, if it had been so proposed.

Alderman Preston said, of course, if they had gone on as before, they might have had a reserve fund of £12,000 instead of £6000. He thought if they could lend out gas-stoves on hire, they might materially augment the consumption of gas. He also suggested that the Committee might take into consideration whether it would not be desirable to have another exhibition of gas appliances.

The motion was then put and carried.

THE INCREASE IN THE PRICE OF GAS AT BARNSLEY.

The Directors' Defence.

A Special Meeting of the Barnsley Gas Company was held last Thursday to consider the Directors' report of the result of a meeting between the Board and a deputation from the Town Council with reference to the notice given by the Company of an increase in the price of gas of 4d. per 1000 cubic feet, to which allusion has been made in previous issues of the Journal. Mr. E. G. Lancaster, one of the Directors, presided; and in defending the action of the Board, he said that from 1881 to 1883 agitations arose, and the result was a reduction in the price of gas. At that time tar was realizing from 55s. to 60s. per ton; now they were selling it at 25s. per ton—a difference of £750 per year. Ammoniacal liquor then produced 23s. per ton; now it was selling at 13s. 9d. per ton, or a difference of £650 per annum. When the residuals fell in value, the only thing for them to do was to pay a smaller dividend. Since 1881 they paid 2½ per cent. less dividend than they were entitled to; and as Directors they discussed the question of the price of gas, having found long before that their contracts for coal had gone up 30 per cent. If they had not advanced the price of gas, the shareholders would have had to accept less dividend by 2½ per cent. They made contracts for coal for twelve months; and would have to pay something like £1200 per year more for their coal supply. The residuals were disposed of by contract for twelve months beforehand. The shareholders, he said, would see the position in which the Directors had been placed. Speaking of electric lighting, he pointed out that they did not regard it as an enemy to gas. By all means let the electric light come to Barnsley; and they would fight it at all costs. Although they received from the public lighting something like £1550 per year, the Company as ratepayers contributed £750. The Corporation had put on the rates as they liked; and the Company had never appealed against them—saying that so long as they had the monopoly to supply gas, they would not interfere. They would observe that the Corporation received back again one-half of the amount paid for public lighting; and if they decided to bring in the electric light, the position would be altered. If the ratepayers chose to spend £20,000 to £40,000 in putting down electric lighting plant, they were quite willing for them to do so. If the Corporation could borrow £40,000 at 3 per cent., which they might do, it would cost them more than they paid the Gas Company for lighting the town, because they would, even in producing electric light, have to purchase coal at the advanced rate, and probably would have to consume from 15 to 20 tons per day. Referring to the advice which had been given at a public meeting, that consumers should send in their meters, the Chairman said they expected that some 200 meters would be returned; but the result was only four meters had been sent in, and the Company had fixed 25 new meters, one of which was equal in lighting power to the whole four which had been sent in. Mr. Lancaster then proceeded to contrast the price of gas in Barnsley with other towns and showed that the figures quoted

were favourable to Barnsley. Referring to the future action of the Company, he said at the conclusion of the current contract with the Corporation, they had under consideration certain changes. They had worked in a friendly way with the Corporation; and they meant to meet them amicably in the future. They proposed that if the Corporation would find the lamps, place them, clean them, and keep them in repair, they would find the gas for lighting them at the rate of 1d. per night. Suppose if they burnt 365 nights, they would light them for 1½d. per night of 8 hours, 1¾d. for 10 hours, and 1¾d. for 12 hours. If these terms were accepted, he defied the Corporation or any electric lighting company to come to Barnsley, and put down plant and beat them. Before concluding, he pointed out that there might be an advance in the price of residuals, which would somewhat balance the extra charge for coal; and if such was the case, the consumers might rest assured that their interests would not be neglected. Mr. Senior moved that the price of gas be not advanced; and the motion having been seconded, the Chairman asked if any gentleman outside the Board would move an amendment. No one did so; and in order to test the feeling of the shareholders, the Chairman proposed, as an amendment, that the action taken by the Company be confirmed. Mr. Taylor seconded the amendment, which was carried.

BRADFORD CORPORATION GAS AND WATER SUPPLY.

The Committees' Annual Reports.

At a Special Meeting of the Bradford Town Council last Saturday week, the annual reports of the Committees having charge of the gas and water undertakings were submitted and adopted.

The Gas and Electricity Supply Committee in their report stated that during the past year there have been 20,308 yards of gas-mains laid, and 1245 new service-pipes. At the Mill Street works no new retorts have been required; and the old ones having been thoroughly repaired, are now in good condition. Sixty retorts at the Thornton Road works have been taken down and replaced with new ones; the remaining 260 have been repaired; and the works are in a satisfactory condition. At the Valley Road works, 150 retorts have been replaced with new ones; and the remaining 400 have been repaired. These works are also in a satisfactory condition. No new retorts have been required at the Birkshall works; the old ones having been thoroughly repaired, and are now in good condition. Two of the boilers at these works have been fitted with Perret's patent dust-fuel furnaces; the tender of Messrs. B. Donkin and Co. having been accepted for carrying out the work for the sum of £175. The apparatus has only been in use a few weeks; but so far it has worked satisfactorily. Contracts have been entered into for the supply of 110,000 tons of coal and 31,500 tons of cannel on satisfactory terms, having regard to the enhanced prices in the market. The contract with Messrs. Stainsby and Lyon for the purchase by them of the tar produced at the several works of the Corporation has been renewed for a further term. The number of cooking-stoves sent out on hire since the opening of the Gas-Stove Department in April, 1884, is 535. The number of cooking and heating stoves sold since the above date is 4243. It has been decided, in place of letting gas-stoves on hire, to sell the same on payment by instalments, extending over periods varying from three to five years. At the Frizinghall chemical works 2030 tons of sulphate of ammonia have been manufactured during the year, against 1722 tons last year; the average price being £12 3s. 7d., against £11 15s. 6d. for the previous year—giving an advance of 8s. 1d. per ton on the quantity sold. There have been 1715 tons of sulphuric acid produced from the spent oxide of iron, of which 1454 tons have been used in the manufacture of sulphate of ammonia. The quantity of sulphuric acid manufactured last year was 1292 tons. Considerable repairs have been executed during the year, owing to the dilapidated condition of the buildings, and some of them have been taken down and rebuilt. During the year the lighting of the borough has been efficiently kept up. The number of two-light lamps in use is 725; being 51 more than last year. The number of ordinary lamps in the out-districts is 491, being an increase of 41; and the number within the district of supply is 5500—making the total number of lamps in the borough 6716, against 6407 last year. The number of lamplighters employed is 77. The report referred, in conclusion, to the establishment and progress of the works for the supply of the electric light.

The Water-Works Committee in their report stated that a constant supply of water has been maintained during the year. The connection between the high and low levels has been finally completed. It has been determined to extend the filter-works to that part of the high level served by the Thornton Moor reservoir; and the works are now in progress. The reservoirs on the low-level part of the system have continued in good working order, and the conduit has been kept in repair. Cast-iron pipes have been substituted for masonry at the weak portion of the aqueduct near the village of Draughton. The new division at Gilstead has proved perfectly water-tight, and of great advantage to the works. The work in the department which deals with the prevention of waste has been kept well in hand; and the amount of night leakage maintained at the lowest possible amount. An interesting statement in the report is the number of leakages that have been detected and repaired during the year. From lead service-pipes there were 1413; from taps of various kinds, 2896; from water closets, 331; from service-valves, 31; from fire plugs, 40; and from cast-iron mains, 113. The detection and repair of these 4824 leakages, together with the inspection of about 900 new fittings of various kinds, have necessitated about 23,000 visits, and the issue of 439 notices. The revenue has continued steadily to increase. The income from the sale of water during 1888 was £108,896, as compared with £101,528 in 1887.

ABERDEEN CORPORATION GAS SUPPLY.

Annual Accounts.

At the Meeting of the Aberdeen Town Council last Friday—Lord Provost Henderson in the chair—the Gas Committee reported that during the year ending Sept. 30, the income was (omitting shillings and pence) £51,422, made up as follows: Gas, £51,200; meters, £2209; coke, £3274; tar and ammoniacal liquor, £4589; rents for gas-stoves, £142; and transfer fees, £5. The total expenditure was £52,744. The chief items in the account were: Cannel coal, £24,999; wages of stokers and labourers, £6814; maintenance of plant, materials, and wages, £2472; distribution of gas, wages, repairing, and renewing meters, pipes, &c., £2240; salary of superintendent, £450; rates and taxes, £3986; management salaries, £817; discounts, £1357; bad debts, £359; for gas-stoves, £132; depreciation, sinking, and contingent funds, £8316. This left a balance to be carried to the net revenue account, of £8678, which formed the sole charge of the net revenue account. The discharge of that account was: Annuities, £5428; interest on mortgages, &c., £2009; and amount set aside to reserve and fire insurance fund, £300—total, £7738; leaving a balance on the year's operations of £940. This, along with the balance brought from the previous year's account, made a total balance to be carried to the accounts for the current year of £5401. During the past year 31,618 tons of coal were carbonized, as against 31,741 tons the previous year, at an average price per ton of 15s. 9¾d., against 17s. 4¼d.—a reduction of 1s. 6½d. For the past year 327,154,000 cubic feet of gas were manufactured; and of this amount 299,476,700 cubic feet were accounted for, as compared with 325,515,000 cubic feet manufactured in the previous year, and 294,721,300 accounted for—being an increase in the manufacture for the year of 1,639,000 cubic feet. The quantity of gas unaccounted for last year was 27,677,300 cubic feet, equal to 8·46 per cent. of the whole quantity, and representing a money value of £4843. Bad debts for the year were £359—an increase over those of the previous year of £60. The Committee recommended that the price of gas should remain at 3s. 6d. per 1000 cubic feet, but that the charge made as rental for meters be abolished, except in those cases where sub-meters are now in use for some special purpose required by the consumer. For 1889-90, the total estimated revenue was £60,500; and the total estimated expenditure, £61,487.

Mr. Collie, the Convener, moved the adoption of the minutes. He said they would see that during the past year they had sold 299,476,700 cubic feet of gas. This was about 5 millions more than in the previous year; but they received £4400 less than in the preceding year. This came about from the reduction of 4d. per 1000 cubic feet in the price of gas last year. The coke account showed an increase of £170, and this even on a less quantity of coal carbonized. This was accounted for through the satisfactory working of the regenerative system of heating the retorts, introduced three years ago. Referring to the tar and ammoniacal liquor account, they would find that the income from that source was £4589; being an advance on last year of £1200, and the increase promised to continue for some time. The income from tar was regulated by a sliding scale; so that when the market rose, they obtained the benefit, and the same with the contractors, when the market fell. The ordinary expenditure for the year was £52,744; while the reserve fund, annuities, and interest absorbed above £7700. Taxes were increased by rather more than £800. This took place from the works and undertaking being valued at a much higher figure. Bad debts amounted this year to £359; being £60 more than last year, caused by several rather heavy failures; but it was expected that they would be reduced next year. There was on the year's working a balance of £940, which, together with the former balance of £4460, made this item up to the handsome sum of £5401 to begin the year with. With this balance in hand the Committee proposed to abolish the charge for gas meters, which would benefit a great number of consumers. In many cases the benefit would be equal to a reduction of 8d. to 1s. per 1000 feet. The balance they meant to set apart to pay off a portion of the stoking machinery, which would be in full operation next winter, and would be a very great saving. The fire insurance now amounted to £7367; the usual sum of £300 and £271 of interest being added to it during the past year. The leakage this year had been reduced to 8¼ per cent.; being 1 per cent. less than last year, and only half what it was some of the first years after the Corporation took over the undertaking. The estimate for next year had been made up with great care; and, he had no doubt, would turn out well, and leave a good balance.

The minutes were adopted.

THE EDINBURGH AND LEITH GAS COMMISSIONERS AND ELECTRIC LIGHTING.

The Edinburgh and Leith Gas Commissioners held a meeting last Friday—Lord Provost Boyd presiding—to consider their position with reference to electric lighting. The Works Committee reported that at their meeting on the 21st ult., they had before them a copy of an opinion obtained by the Board of Trade from the Lord Advocate, on a case submitted by the Board, as to who is the Local Authority for electric lighting purposes within the district of the Commissioners under the Electric Lighting Act, 1882, by which the Lord Advocate advised the Board of Trade, that, in his opinion, the Corporations, as Police Commissioners, are the respective Local Authorities for the purposes of that Act, and that they, having taken the Lord Advocate's opinion into their consideration, recommended the Commissioners to adhere to their resolution refusing the Commissioners' consent to any company obtaining powers within any part of the Commissioners' district, and further to oppose any application by any Company for such powers—leaving it to the Corporations to deal with the question as they think fit, in consequence of the Lord Advocate's opinion—and to co-operate with the Corporations in any action which they may resolve to take.

Mr. Colston, in moving approval of the Committee's recommendation, said the only course open to them was to affirm the recommendation of the Committee. They did not know what the outcome of the future might be; but it was quite clear that, as Gas Commissioners, they were placed in the position that they could adopt no other course than that suggested.

Bailie Turnbull seconded the motion. There could hardly be a doubt, he said, that they should not allow the electric or any other system of lighting in the city to come into the hands of any other party.

Bailie Archibald, as one of the representatives of Leith, entirely concurred with the recommendation. They had taken over the gas undertakings, and they had not only paid a price for them, but they had paid an enormous sum for a monopoly which had been created by Act of Parliament. They must let the ratepayers understand this, that all the property in Edinburgh and Leith was mortgaged and pledged for the value of the two gas undertakings, which was upwards of a million sterling. It should be kept before the ratepayers that, if they permitted the introduction of electric lighting into the city, it would, in turn, become a monopoly. It would come in without paying anything at all; and it would enter into competition with them—the representatives of the public—who had already paid large sums for a monopoly. That was the first consideration. The next consideration was that the public lighting of Edinburgh and Leith, and the supplying of light in the city generally, had been made a municipal concern, as much as the provision of water; and therefore they must safeguard the interests of the public. When it was proved that electric lighting was better or cheaper than gas, then, instead of allowing a company (which would require to be bought up) to establish itself in the city, the Corporations would supplement the gas supply by electric lighting.

Mr. Cranston concurred in everything that had been said; but what they were going to do would all come to nothing, if the Board of Trade were to have the power to force them to do what they thought proper. He contended that they (the Commissioners) were the judges of when they should take up electric lighting, and not the Board of Trade. It was a disgrace for Parliament to give such power to the Board, who were apt to be influenced by all those who were interested in syndicates, and who did not care whether or not the ratepayers should lose half a million of money. They should take steps to have that power stopped The thing was ridiculous. It was almost pure despotism; and he thought they had better keep their eyes open as to what they were about.

The Committee's recommendation was adopted.

Shoreham Water-Works Company.—From an available balance of £866, the Directors of this Company have declared a dividend of 5 per cent. on the preference and the ordinary shares, with a bonus of 3 per cent. per share on the original shares.

NOTES FROM SCOTLAND.

(FROM OUR EDINBURGH CORRESPONDENT.)

EDINBURGH, *Saturday.*

At the meeting of the Edinburgh and Leith Gas Commissioners last Friday, it was reported that the output of gas during September was as follows:—From the Edinburgh works, 51,587,000 cubic feet, an increase of 1,391,000 feet; from the Leith works, 28,941,000 cubic feet, an increase of 3,659,000 feet. The Commissioners also considered, in private, a memorial which had been presented to Mr. R. Mitchell, the Engineer of the Edinburgh works, by his workmen, asking for an increase of wages and other concessions. Mr. Mitchell submitted a statement showing the conditions under which the Glasgow works are conducted. Mr. F. T. C. Linton, the Engineer of the Leith works, stated that his men expected to share in any advantage that might be given to the Edinburgh workers. The Commissioners resolved that the wages of the firemen should be increased from 6¼d. to 7¼d. per hour, barrow-men from 5¼d. to 6d., and engine-men from 5¾d. to 6d. per hour, but that no general rise should be granted to the yard-men, purifier-men, or limehouse-men. Mr. Mitchell was, however, empowered to increase by ¼d. per hour the wages of deserving men of the classes referred to. They also decided to recommend that the Leith men should be similarly treated, retort men there to receive an advance of 1d. per hour. Mr. Mitchell estimated that these concessions to his men would mean an increase of wages of nearly £2000 a year, and Mr. Linton calculated that it would increase the Leith pay-bill by £690 per annum. It was stated that the men accepted these terms.

Contrasts are usually instructive; or perhaps, to speak more correctly, one can perceive the bearings of an object better if there is contrast in it than if there be similarity. This week I have a good specimen in the treatment of the question of electric lighting by the Gas Commissions of Edinburgh and Dundee. On that subject yesterday was an important day with both of these bodies. The Edinburgh and Leith Commissions met and resolved to do all in their power to prevent electric lighting from obtaining a footing in the city in such a way as would constitute a monopoly inimical to the public interest; and the report of a Dundee Committee was published, which recommends the Gas Commission to seek statutory powers to supply the light themselves. Which of the two attitudes is the more to be commended? In Edinburgh, the Commission is young and its members are desirous of having an opportunity of realizing the expectations which they have formed of the great power they have become possessed of. They are anxious that for some years they should have an entirely free field in which to shew what can be done by Corporation management. Their greatest bugbear is the electric light, because its introduction would upset all their calculations, and might paralyze their efforts. This would be specially so were they themselves to introduce it, because the initial outlay would mean the creation of capital, and most probably the disturbance of their revenue. From their point of view, it is therefore out of the question that they should be themselves the suppliers of electric lighting. Being a public body, with the interests of the community at heart, they consider it their duty to have an eye to futurity; and so they seek to prevent a state of things arising which would entail a large outlay in time to come. In Dundee, the Gas Commission has shown remarkable powers of vitality. Its revenue is a growing one, and its position generally so firmly established, that a side adventure, even though it were not a success financially, would not affect either its reputation or its credit. Thus, two similar bodies, each with some show of reason, take directly opposite views of the same subject. It may be noted that the Dundee Commission is more favourably situated for the promotion of electric lighting than is its neighbour in Edinburgh, because of the large number of manufactories in the former place. In that connection, Mr. Colston made a most appropriate remark when he pointed out that in Edinburgh hotels are deserted during the winter, and that therefore electric lighting could only be required for a few months in the year. The above is all reasoning in the abstract; but the question which really presents itself for decision is not theoretical. It is severely practical, and comes up in this way—whether it is easier for a representative body to deal with its own constituents or with outsiders. The Dundee Gas Commission seems to think it safer to trust to its own constituents; and there is a good deal to be said for that view. When the safeguards provided by the statute are taken into account, electric lighting is not likely to be so readily taken up if provided at their own charge as it would be if provided by a concessionary company. The obtaining of the power to supply light may in the hands of an unwilling Gas Commission mean little more than the obtaining of power to keep another out. The Dundee Commission will, if successful, settle the question once for all; whereas the Edinburgh Commission, if they succeed, may have to renew their opposition year by year. If they fail, the question will be settled for them; but in a way which, according to their present light, would be disadvantageous to the city. At present, however, the position of the Commission is such, as stated above, that it was scarcely open to the Commissioners to come to any other conclusion than the one they arrived at.

The Aberdeen Town Council yesterday, in prosecution of a proposal to obtain a Provisional Order empowering them to supply electric light, appointed a deputation of three of their number, along with the Gas Manager (Mr. A. Smith) to visit several towns in England for the purpose of collecting information on the subject.

The Aberdeen gas accounts, which were adopted by the Town Council yesterday, again show a satisfactory increase in all the departments. Most noteworthy is the reduction of leakage from 9½ per cent. to 8½ per cent. during the year. When the Corporation took over the gas undertaking, the leakage was 15½ per cent. A comparison of the figures with those of previous years brings out how thoroughly well established and prosperous the business is, and points to careful and enlightened management on the part of those at its head. This is apparent when it is considered that by abolishing meter-rents a sum of over £2000 is given up; while last year a reduction in the price of gas by 4d. per 1000 cubic feet involved a decreased rental of £4400, and in the previous year a reduction of 2d. per 1000 feet diminished the rental from gas by £472. Any body which in three years can afford to part with £7000 of revenue, must be in a healthy and flourishing condition.

(FROM OUR GLASGOW CORRESPONDENT.)

GLASGOW, *Saturday.*

The stokers employed at the various works of the Glasgow Corporation Gas Commissioners have obtained a remarkable triumph this week. When they resolved on pressing their demand for a working day of eight hours, they came to the conclusion that their best policy was to put their case into the hands of a skilled legal expert who has had extensive professional practice in the local Law Courts on behalf of the artizan population. Mr. Angus Campbell, solicitor, was the gentleman selected, and he so conducted the case of the stokers that he managed to put the Corporation Gas Committee into a "cleft stick." The agitation was not allowed to assume a public shape until the month of October was far advanced; so that with "dark November" close at hand, and the heaviest portion of the lighting just commencing, the Committee were not in a position to offer the slightest resistance. They might negotiate and parley and temporize; but so surely as the first day of November came round, so surely were the workmen to come out on strike for the concession of their terms. A small Sub-Committee met a deputation of the men on Wednesday, but no indication was given that the terms of the demand would be conceded. On Thursday, the full Gas Committee held a meeting to receive a report from the Sub-Committee, whose recommendation was that, in the circumstances in which they were placed, the demand by the workmen should be granted. After giving the matter the fullest consideration, the Committee directed the General Manager (Mr. Foulis) to forward a copy of the following letter to the station managers at the three works:—"Dear Sir,—The Gas Committee, at a meeting this afternoon, had again under consideration the petition of the retort-house workmen. While the Committee are unanimously of opinion that the demand of the men, amounting as it does to an increase of wages to the extent of 50 per cent., is excessive, and while regretting that the men have not seen their way to modify their views to any extent, they have resolved, in order to avert the public inconvenience which might result from changing so large a body of men at this season of the year, to reduce the period of labour of all men working in shifts to eight hours per day; the work and wages to remain as at present. This is the most inconvenient season of the year to make any change in the method of working. The labour involved in reorganising the works will be considerable; but as it is necessary that the change should be effected before the winter is much further advanced, every effort will be made to get the additional shifts organized by Monday, the 11th of November, or as soon thereafter as possible. Eight hours will, in any case, be considered a shift from and after that date. Please communicate the contents of this letter to the men this afternoon.—Yours truly, W. Foulis." It is still said that to make such a concession will involve an additional expenditure of £20,000 per annum; but it is just possible that the amount may have been rather over-estimated. If it is to be anything like that amount, there is every probability that the propriety of adding a penny or twopence per 1000 cubic feet to the price of the gas will very soon receive most anxious consideration from the Gas Committee. I have no doubt, however, that another very important matter will also press itself upon their attention for consideration. I refer to the propriety of the general adoption of stoking machinery at all the works belonging to the Corporation. It may be remembered that Mr. Foulis's stoking-machines were in use some years ago at the Dawsholm Gas-Works; and that owing to some kind of petty jealousy showing itself in the Town Council, it was resolved by the Gas Committee to discontinue their use. I daresay they now very bitterly regret having done so, for by this time machines of the same kind, and greatly improved in their details, might have been in use both at Dawsholm and the other two works. I know for a fact that one strong and influential member of the Committee is ready to move in the direction that I have just indicated; and he will doubtless be much encouraged to take action by the fact of the Aberdeen Gas Commissioners having resolved some time ago to introduce stoking machinery into their works.

In connection with the agitation amongst the Glasgow gas stokers for a rearrangement of the terms of their employment, a crowded meeting of the men from all the stations was held on Wednesday. After a stirring speech from the Chairman, who pledged them to hold out for the full measure of their demands, the following resolution was moved and seconded by two of the Dawsholm men—"That in view of the probable attempt to victimize the men who had taken a prominent position in the present movement, this meeting believes it necessary that a Union should be formed in order to protect the interests of all concerned; and with that object resolves that immediate steps be taken to elect the necessary officers in connection with the proposed organization." After a speech in its support by the Secretary of the Glasgow Branch of the Seamen's and Firemen's Union, the resolution was adopted by acclamation, and the office-bearers were subsequently appointed.

On two or three occasions this week the ordinary shares of the Partick, Hillhead, and Maryhill Gas Company have been sold on the Glasgow Stock Exchange at £5 5s. per share, and the quotation for the preference shares has ranged from £5 13s. 9d. to £5 15s. per share.

The sulphate of ammonia market has continued steady this week, at £11 15s. to £12 per ton on spot; and for forward delivery there are few sellers under the higher quotation. The price at the same date last year was £12 5s. to £12 10s. per ton.

There has been a great amount of excitement in the Glasgow pig iron market this week. During the first part of the week the tone was exceedingly strong, and on Tuesday the price of Scotch warrants advanced to 60s. 4½d. per ton cash. Subsequently, the tone became rather quieter; and yesterday there was a slight collapse, the price at one time being as low as 56s. 6d. per ton cash. But at the close there were buyers at 57s. 1d., with sellers at ¼d. per ton higher. The buying during the week was principally in hematite iron, for which up to 72s. 9½d. per ton was paid. At the close yesterday afternoon, however, there were sellers at 70s. 7½d., after 69s. 6d. cash had been accepted. In respect of Cleveland pig iron warrants, the tone still continues to be very strong as compared with Scotch warrants; and yesterday the price closed at 56s. 6d. per ton cash buyers, though in the course of the week the price reached the maximum of 58s. 9d. cash.

There is still an all-round healthy demand for all kinds of fuel, both on home and on foreign account. Main coal is reported stiff at 9s. per ton f.o.b.; but the price of splint coal has eased a little—10s. 9d. per ton being now accepted for delivery at the ship's side. The agitation for higher wages amongst the miners gains strength every day.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 2.

Sulphate of Ammonia.—Spot parcels have been rather more freely offering during the week; but the demand has been correspondingly good, and the steady tone of the market has been maintained. A great portion of the available lots have, no doubt, been secured by dealers to complete their October deliveries; and doubts may, therefore, exist whether the demand will be sustained sufficiently to meet the heavy November production. But to the unbiassed mind, a decline is little to be feared; there being practically no accumulation of stocks, either at the works or in consumers' hands. That buyers' requirements are not entirely filled, present inquiries fairly demonstrate; and if not a few of the orders are being taken by speculators, it does not follow that the market must do their bidding and come down. The great bugbear is, of course, nitrate of soda; and its low value and unfavourable position (precluding apparently any chance of improvement) furnish food for serious reflection. The present price of nitrate makes *nitrated* superphosphates very much cheaper than *ammoniated;* and the sale of the former is, therefore, pushed all the harder in Germany, &c. Still it has been sufficiently shown in these columns that the influence of nitrate does not reign supreme; and for months past now a difference of about £3 10s. per ton

has been maintained, in favour of sulphate. The nitrate shipments have again been heavy for October (over 100,000 tons); and to-day's visible supply is about 130,000 tons in excess of last year, notwithstanding the fact that the consumption during the first ten months of the year increased about 45,000 tons, against the same period in 1888.

LONDON, *Nov.* 2.

Tar Products.—Benzols and naphthas are slightly firmer than last week. Anthracene is also being held for higher prices, although but little is changing hands at anything above last week's figures. Pitch is in fair demand, and will probably maintain its present position if not improve it. The prices may be taken as follows:—Pitch, 25s. to 32s. 6d. per ton. Tar, 26s. to 32s. per ton, according to position. Benzols (90 per cent.), 3s. 2d. per gallon; (50 per cent.), 2s. 3d. per gallon. Toluol, 1s. 6d. per gallon. Solvent naphtha, 1s. 7d. to 1s. 9d. per gallon. Crude naphtha (30 per cent.), 1s. 2d. per gallon. Light oil, 4d. per gallon. Creosote, 2½d. per gallon. Carbolic acid (60's), 3s. 4d. to 3s. 5d. per gallon. Cresylic acid, 10d. per gallon. Anthracene (30 per cent.), "A" quality, 1s. 1d. to 1s. 1½d. per unit; "B" quality, 11½d. to 1s. per unit.

Ammonia Products are much as they were last week. Sulphate, if anything, is easier. There seems, however, no cause for anxiety. Prices: Gas liquor (5° Twaddel), 7s. to 8s. per ton, with a rise or fall of 1s. 6d. per degree. Liquor ammonia, 1¾d. per lb. Carbonate of ammonia, 3¼d. per lb. Muriate of ammonia, brown, £22 per ton; white, £29 per ton. Sal-ammoniac, £34 to £36 per ton.

THE ELECTRIC LIGHTING QUESTION AT CHELTENHAM.—At a recent special meeting of the Cheltenham Town Council, it was decided to make application for a Provisional Order to authorize the Corporation to supply electricity for public and private purposes within the borough. The result of this decision will be that the consent of the Local Authority will be refused to all the intended applicants for lighting powers within their district.

THE BIRMINGHAM ELECTRIC LIGHTING ORDER.—In the Provisional Order which Messrs. Chamberlain and Hookham recently obtained, empowering them to supply electricity in a central area of Birmingham, one of the conditions made by the Corporation was that a company should be formed to carry out the scheme, with a minimum capital of £50,000. It is now reported that the Order is to be placed in the hands of a strong combination to fulfil this condition. Messrs. Holmes and Vaudrey, Electrical Engineers, of Liverpool, have, it is understood, arranged with Messrs. Chamberlain and Hookham to purchase their interest in the Order for a comparatively small sum; and in the event of the company to be formed appointing them Engineers, they will transfer the Order to the company at the same price which they have paid to Messrs. Chamberlain and Hookham. An influential directorate is in course of formation, including two well-known Birmingham men; and the capital of the company will be in excess of the minimum fixed by the Order. The prospectus will be placed before the public in a few days; but it is rumoured that a large number of shares have practically been already taken up.

LIVERPOOL CORPORATION WATER AFFAIRS.—In the course of the proceedings at the meeting of the Liverpool City Council last Wednesday, Alderman Bower proposed the confirmation of a recommendation of the Water Committee to the effect that the Standing Orders be suspended in order that the Council might be enabled to consider recommendations of the Water Committee as to the insertion in the Bill of the Corporation in next session of clauses for the equalization of water charges as between the city of Liverpool and the borough of Bootle, and of clauses for the confirmation of an agreement for the supply of water to the Liverpool Hydraulic Power Company. The Committee further recommended that the Council confirm the agreement approved by the Water Committee for the supply of water to the Hydraulic Power Company, whereby the Company agreed to take water exclusively from the Corporation, and the Corporation agreed to permit the Company to lay down such mains, branches, and service-pipes, in any streets within such part of the Company's district within the city as might be reasonable and necessary to supply hydraulic power to intending consumers, provided that the line of route of such mains, &c., shall be in the sole discretion of the Corporation. The recommendations were confirmed without discussion.

THE COST OF AN ELECTRIC LIGHTING SUPPLY FOR THE THREE TOWNS.—A public meeting was held at Plymouth, yesterday week, to discuss the "desirability of giving to the Three Towns of Plymouth, Stonehouse, and Devonport the advantages of an electric supply for lighting and other purposes from a properly-organized centre." The proceedings were of more than ordinary interest, as in the first place Plymouth can boast of having a supply of gas at the low price of 1s. 9d. per 1000 cubic feet, and in the second place, Mr. Bingham of the London House-to-House Electric Lighting Supply Company was present, and gave some attractive figures regarding the cost of an installation suitable for the Three Towns, and the profits to be derived therefrom. The Company had canvassed the neighbourhood, and had obtained provisional contracts for 4000 lights. They recommended, Mr. Bingham said, that a station should be laid down of the size of that now working at Kensington, where there were three units of plant, each of which was capable of supplying 4000 of the smaller, or 2000 of the larger lights. The cost of the station would be somewhere about £30,000; and the yearly expenditure was about £5310. Supposing they had a maximum supply demand of 4000 lamps, which would safely admit of 6000 lamps being wired, they would find that the average consumption would amount to about 1500 hours per annum; and as the charge for electricity which had been sanctioned by the Board of Trade was 8d. per unit, the receipts from the 6000 lamps per year would give £10,000, as against an expenditure of £5310. At the same time, he said, the charge of 8d. per unit was not unfair to the consumer. Had it been so, it was certain that neither Parliament nor the Board of Trade would have sanctioned it for the Metropolis. But in the event of the station growing to larger dimensions, the question of price would be settled in quite another way altogether. Supposing that they ultimately obtained 15,000 16-candle power lamps taken up in the Three Towns, with a maximum supply of 10,000 demanded, they would then find that the receipts and the expenses would not increase in the same ratio. The expenses would not be very greatly added to in comparison; and when the extension reached the dimensions he had stated, then their profits, at the same rate and at the same price, would be not a little over 10 per cent., but approximately more nearly to 25 per cent. Of course, no company would be allowed to put that amount into its own pocket, and the knot would be cut in this way—reduction of price would be forced upon them, even if they were disposed not to allow it. Mr. Bingham mentioned that he was not one of those who believed that electricity was going to supersede gas; but he thought there was room for both. He also calculated the cost of electricity to be equivalent to gas at 3s. 6d per 1000 cubic feet. Several questions were put to Mr. Bingham; but no resolutions were proposed.

MANSFIELD WATER SUPPLY.—The Mansfield Commissioners, who, it will be remembered, recently purchased the water undertaking for £30,500, have made application to the Local Government Board to be empowered under sections 6 and 7 of the Public Health (Water) Act, 1878, to require that every dwelling-house should be provided with a proper supply of water before being occupied. The Local Government Board directed that an inquiry should be made into the matter; and this was held by Mr. Arnold Taylor last Tuesday. The Clerk to the Commissioners (Mr. Hibbert) explained the object of the application, and said that it was their desire to make the concern a success. The Commissioners were therefore desirous of obtaining all the powers they could. Section 7 empowered them to enter any already built premises, and ascertain if there was a proper water supply. The Inspector inquired if the Commissioners also applied for the powers conferred by section 8. In reply, Mr. Hibbert said not at present, inasmuch as they had the fixed scale of charges taken over from the Water Company; and there had not been time to ascertain how it would work. No opposition was offered; and the Inspector stated that he would report the matter to the Local Government Board.

THE DEPOSIT AND METER-RENT QUESTIONS AT BOLTON.—At the last meeting of the Bolton Town Council, the presentation of the Gas Committee's minutes afforded Mr. Kirkman an opportunity for making a few remarks. He bore testimony to the admirable results attained by the abolition of the deposit system; saying that there had been an increased number of consumers by 2600 since February, and there had been an enormous sale of miscellaneous fittings. He now advocated the doing away with meter-rents, which, he said, would benefit thousands of poor widows, and lead to an increased consumption of gas in the borough, as well as to the popularization of the Gas Department. Mr. Broughton said the deposit matter was as yet only in an experimental stage. It appeared to be going on pretty well; but nothing very definite could be said about it at present. The credit for an advantageous reform in this respect was due to Mr. Alderman Miles. They might increase their consumption by abolishing meter-rents; and the next step to increase it would be to give the gas away. If they ceased to charge meter-rents, they would want £2000 or £3000 from somewhere; and if it did not come from rents, presumably it would have to come out of the ratepayers.

NEW WATER-WORKS FOR MORLEY.—A special meeting of the Morley Town Council was held last Thursday for the purpose of considering the expediency of an application being made to Parliament in the next session for leave to introduce and promote a Bill to authorize the Corporation to construct a reservoir and water-works for the borough at Wittien's Clough, near Halifax. The Town Clerk (Mr. R. B. Hopkins) having explained the legal course to pursue, the Mayor (Alderman D. Thackray) said that, although the meeting was a formal one, he regarded it as being one of the most important that the Council had held for some time. At the last meeting (*ante*, p. 759) the Town Clerk submitted an exhaustive report in respect to the scheme. Since then his Worship had examined the water revenue account of the Corporation for last year, and found that for water consumed by meter they received £3016, and for cottage property £2411; making a total of £5427. If they could complete the contemplated scheme for the estimate mentioned by the Town Clerk—viz., £85,000—they would see at a glance that they were fully justified in making an effort to carry out the scheme, considering their present consumption. Alderman Schofield, Chairman of the Water Committee, moved that the Council make application to introduce a Bill empowering them to construct the proposed works. Mr. Rhodes seconded the resolution; and other members having spoken in support, it was carried.

THE NORTHERN COAL TRADE.—There has lately been continued activity in the coal trade of the North of England; and both for home consumption and for export, very heavy quantities have been disposed of during the last few days. Northumbrian steam coals are steady at 10s. per ton net, free on board in the Tyne; and a higher price is asked for contracts over next year. Small steam coals are 5s. 6d. net, free on board. In gas coals more is being delivered on old contracts; and so much of the output of many of the chief collieries is thus taken up, that the quantity left for sale is limited. Heavy supplies are now being taken for London; and this large demand has forced up the rate of freight from the Tyne to the Thames, most of the coals being sent by sea. The price asked for best gas coals is now 10s. 6d. per ton; and it is stated that there has been one contract closed for coal, to be delivered over the first three months of next year, at 11s. per ton, free on board. The gas coal collieries are now contracting largely for smithy coal for shipyard and allied purposes, and for this they are obtaining considerably increased prices—contracts which for the present year have been based on a selling price of 6s. 6d. per ton having now been renewed for next year at 9s. per ton. Coke is selling very well, and for blast-furnace qualities as high a price as £1 5s. per ton, free on board in the Tyne, has been asked. More gas coke is now being made; but there is a keen demand for it especially by the cement manufacturers; and it is certain that much higher prices will rule soon for this kind of fuel.

REVIVAL OF THE OLD STORY OF "AIR IN GAS."—At the meeting of the Brighton Town Council last Wednesday, Alderman Hallett revived an old grievance of gas consumers which most people supposed had been satisfactorily disposed of long ago. He complained that, since the removal of the Gas Company's works to Portslade, gas bills had increased, although the price had been reduced, and no alterations had been made in the conditions of supply. This puzzled him until he came across a passage in Dr. Sheridan Muspratt's "Chemistry of Manufactures," which enlightened him. Referring to similar complaints which had been made in Liverpool, Dr. Muspratt stated, in response to an inquiry by the Editor of the *Liverpool Journal*, that by the introduction of air into the mains, so that it entered the meter and was measured in combination with the gas, it would tell against the consumer, and the light emitted would be deteriorated. The inference was obvious. The worthy Alderman said he mentioned the matter because there were, he thought, sufficient grounds for saying that it was not beyond the cognizance of the Brighton and Hove Gas Company that atmospheric air had, in the past, been forced into the mains. The Council were shortly to appoint a new Gas Committee; and if that Committee inquired, he believed they would find that this practice had not been discontinued. He was not going to argue that the introduction of air affected the quality of the light, after their own tester had reported that the gas had a certain illuminating power; but he thought it quite possible that the new Committee would discover, by experiment, that even in that sense there would be a very serious injury to the consumer. There was one thing they could clearly see—that if one paid for 100 cubic feet of coal gas for heating purposes, and only got 95 feet of gas and 5 feet of air, one would not be able to burn 100 feet of gas. They had an Analyst who, among other things, reported upon milk; and if he found that water had been added to it, he described it as adulterated. Surely, then, if in coal gas they detected atmospheric air, artificially introduced in order to alter the meter, they ought to describe it also as adulterated, and deal with the persons who supply it in the same manner as they would deal with persons supplying other adulterated articles.

Wolverhampton Corporation and Electric Lighting.—The Wolverhampton Corporation have refused to grant their consent to the application of the Wolverhampton Electric Light and Power Company, Limited, and the Midland House-to-House Electricity Company, Limited, for Provisional Orders under which they intended to supply electricity for public and private purposes in the borough; and the Council have determined to make application for an Order with the same objects on their own account.

Margate Corporation Water Supply.—At the meeting of the Margate Town Council last Tuesday, a report was presented by the Water Committee in which they recommended that the sum of £660, being the balance of the loan of £10,000 sanctioned by the Local Government Board for the extension of the Dane water-works, be now expended in making further adits, and also that the sum of £650 be raised by the issue of debentures at 3½ per cent. per annum, repayable in thirty years, to defray the cost of these works. The report was adopted.

The Cost of the New Water-Works at Croydon.—The new works which the Croydon Corporation found it necessary to construct at Addington for augmenting the supply to the borough, more especially to the higher parts of the district (and which were described in the Journal for Aug. 7 last year), cost about £54,700, whereas the Croydon Water Act of 1884, under which the works were constructed, sanctioned an outlay on them of only £46,000. The Corporation having applied for a Provisional Order to increase the amount authorized to be expended by the additional £8700, Mr. Arnold Taylor, one of the Local Government Board Inspectors, yesterday week held an inquiry into the subject-matter of the application. The Town Clerk (Mr. C. M. Elborough) made a statement, in which he indicated the various items in which the increased expenditure had occurred. There was no opposition.

Projected Railway Siding for the Coventry Gas-Works.—The members of the Coventry City Council have spent a great deal of time at their two last meetings in considering a recommendation of the joint General Works and Gas Committees that application be made for parliamentary powers to acquire the land required for, and to construct a siding from the Coundon Road Railway Station to the gas-works. In support of the recommendation, it was averred, on behalf of the Committees, that the capital proposed to be expended on this siding would repay itself; and it would not only not cost the ratepayers a single farthing, but on the other hand would produce an annual profit, or an annual decrease in expenditure of £500, which could either be used in reducing the price of gas, or in relieving the district rate. The Council on Monday last week adopted the proposal by 19 votes to 10.

New Water-Works at Barnstaple.—The Barnstaple Water Company some twelve months ago commenced to make some important additions to their system; and these are now nearly completed. The original water-works at Rawleigh consisted of two filter-beds, filled by a constantly running stream of water, and a service reservoir. To these have now been added two other filter-beds, each 60 feet long by 40 feet wide, allowing a depth of 2 feet of water. An engine-house has been erected for two 8-horse power engines, which drive two pumps capable of throwing 270 gallons of water per minute. A new high-level reservoir has also been constructed. This is 120 feet long, by 60 feet wide, and when full will average 10 feet depth of water. It is constructed on a solid foundation of concrete. The outer walls are of brickwork, cased in clay puddle, 2 feet thick, which, again, is supported by an earth bank. The roof rests on five bays of brick arches, carried on piers, which run longitudinally throughout the reservoir. With the necessary pipe-lines, &c., these works have cost in round figures £15,000.

Stafford Corporation and Electric Lighting.—In moving, at the meeting of the Stafford Corporation last Tuesday, that consent be not given to the granting of a Provisional Order to the Midland House-to-House Electricity Company, and that application be made to the Board of Trade for the granting of an Order authorizing the Corporation to erect and maintain electric works and lines within the borough, Alderman Peach stated that the ratepayers had a capital at stake in the gas-works of about £85,000, and only £12,000 was paid off, the remainder having to be cleared off in thirty years. He argued that under these circumstances, it would be suicidal to allow any company to share the profits derived from lighting. If the business at the gas-works increased in the same ratio, they would be compelled in the near future to spend something like £15,000, to increase their accommodation; and it seemed to him more desirable to spend the money in providing an electric light installation. Alderman Goodall seconded the resolution, which was carried; and an Electric Lighting Committee was appointed.

Call for Capital by the British Water Gas Syndicate, Limited.—The Directors of the British Water Gas Syndicate, Limited, have issued a circular announcing their intention of calling up the remaining capital of the undertaking—a portion at once, and the rest in about a month's time. The reason assigned for this step is the difficulty which has arisen between the Syndicate and the North British and Nottingham and Derby Syndicates, the result of which has been the postponement for twelve months of the payment by the North British of £100,000 which they were to have paid to the British Syndicate, and the withholding, on account of legal proceedings, of the £50,000 due from the Nottingham Syndicate. The Directors explain that when they announced last May that ample funds were available from the sale of licences, they, of course, looked upon the consideration-money for the grants of licences to the two Syndicates named as being immediately payable. It is believed that the proceeds of the calls will furnish the requisite financial strength for properly developing the business of the Syndicate pending the settlement of the difficulties above alluded to.

Proposed Extension of the Burnley Gas-Works.—The Burnley Town Council adopted last Wednesday a recommendation of the Gas Committee that the property known as Tilling Field Mill should be purchased by the Corporation for the sum of £3500. The purchase, which is an important one, has been made with a view of future extensions of the gas-works, and of establishing electric lighting plant, and also at some future time of making a continuation road to the Fulledge district. When the Burnley Gas-Works were taken possession of by the Improvement Commissioners in 1855, they were capable of producing 384,000 cubic feet in 24 hours; but they can now produce 2,000,000 cubic feet. The largest consumption of gas in one day in 1855 was 267,000 cubic feet; whereas in 1888 it was 2,131,000 cubic feet. Several extensions of the works have from time to time taken place. Mr. Collinge, in reporting the action of the Committee to the Council, explained that they were at present very much cramped for room at the gas-works. The land contained about 3000 yards, on which stood a mill; and it would probably be made the approach to the gas-works, the present bridge being very narrow. In the Act they had obtained for the extension of the borough, they had secured the insertion of a clause which enabled them to put down plant adjoining the gas-works, and saved them from having to make their extensions on green fields.

Sale of Gas Stock at Bristol.—Messrs. Alexander, Daniel, Selfe, and Co. sold by auction last Thursday £7000 of the general capital stock of the Bristol Gas Company, at prices ranging from £205 to £206 per cent. Of the entire stock, £6000 was offered by the Company; the remainder by private proprietors.

Water-Works for Philippopolis.—The municipal authorities of Philippopolis have asked for tenders for the construction of water-works. The main and subsidiary supply pipes will cover a distance of about 20 kilometres. The plans and estimates may be seen at the Mairie of Philippopolis, where tenders will be received up to the 18th inst.

Lancashire Corporations and the Electric Light.—The proposal to supply electric light in the borough of Wigan has now taken practical shape. At a meeting of the Corporation Gas Committee on the 23rd ult. it was resolved to apply to the Board of Trade for a Provisional Order for the purpose; and this resolution was confirmed by the Town Council last Wednesday. Alderman Ackerley said in view of the large amount which the Corporation had sunk in the gas undertaking, they ought to have the power of supplying electricity in the borough. If they obtained this power, and ever had to use it, no doubt they could advantageously combine the two concerns. The Burnley Town Council last Wednesday passed a resolution authorizing the application for a Provisional Order to sanction their undertaking electric lighting.

More Electric Lighting Dangers.—Last Friday afternoon, about half-past two, a terrific explosion occurred at Albert Gate, Knightsbridge. It appears that the electric light was being laid on to a new building now approaching completion, when one of the batteries placed underneath the flagstones burst with a loud report, tearing up the pavement for some distance around, and sending the iron plates high in the air. Fortunately, beyond the falling *débris* striking a cab horse, no other damage was done, notwithstanding the fact that it happened at the busiest part of Knightsbridge. An amusing scene, says the *Electrical Review*, was lately witnessed in Paris. One evening the horses passing along the Boulevard des Italiens seemed at one spot to be seized with a kind of vertigo, causing them to jump about like sheep. The disorder became so great that the police had to stop the traffic. The cause of the trouble was soon discovered. One of the electric cables laid under the thoroughfare, and leading to a lamp-post placed on a refuge, had become disarranged, and, coming in contact with the damp wooden pavement, the horses, in passing over it, received a shock. Workmen were soon on the spot, and restored things to their normal condition. The next morning, however, slight shocks, it is stated, were experienced at the same place.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see *ante*, p. 870.)

Issue.	Share	When ex-Dividend	Dividend and Bonus	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	18½—19½	..	5 7 8
100,000	10	„	7½	Do. 7 p. c.	10	12½—13½	..	5 11 1
800,000	100	1 July	5	Australian (Sydney) 5%Deb.	100	109—111	..	4 10 1
100,000	20	30 May	10	Bahia, Limited	20	26—27	+½	7 8 2
200,000	5	15 May	7½	Bombay, Limited	5	7—7½	..	5 0 0
40,000	5	„	7½	Do. New	4	5—5½	..	5 9 4
880,000	Stck.	14 Aug.	12½	Brentford Consolidated	100	228—233	..	5 5 2
125,000	„	„	9½	Do. New	100	162—167	..	5 10 6
220,000	20	12 Sept.	11	Brighton & Hove, Original	20	42—44	..	5 0 0
330,000	20	27 Sept.	11½	British	20	45—47	..	4 15 9
50,000	10	12 Sept.	11	Bromley, Ordinary 10 p. c.	10	20—22	..	5 0 0
39,000	10	„	8	Do. 7 p. c.	10	15—17	..	4 14 1
328,750	10	30 May	10	Buenos Ayres (New) Limited	10	13½—14½	..	6 18 0
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	107—110	..	5 9 1
150,000	20	14 Aug.	8	Cagliari, Limited	20	25—27	..	5 18 4
550,000	Stck.	16 Oct.	18½	Commercial, Old Stock	100	255—260	..	5 5 9
130,000	„	„	10½	Do. New do.	100	205—210	..	5 2 4
130,000	„	28 June	4½	Do. 4½ p. c. Deb. do.	100	122—125	..	3 12 4
557,320	20	14 June	13	Continental Union, Limited	20	48—49	..	5 6 2
242,680	20	„	13	Do. New '69 & '72	14	33—35	..	5 3 9
200,000	20	„	10	Do. 7 p. c. Pref.	20	37—39	..	5 2 6
75,000	Stck.	27 Sept.	10	Crystal Palace District	100	200—205	..	4 17 7
234,060	10	26 July	13	European, Limited	10	24—25	..	5 4 0
120,000	10	„	13	Do. New.	7½	17—18	..	5 8 7
354,060	10	„	13	Do. do.	5	11½—12½	..	5 6 1
5,470,040	Stck.	14 Aug.	18½	Gaslight & Coke, A, Ordinary	100	245—251	+8	5 9 6
100,000	„	„	4	Do. B, 4 p. c. max.	100	100—105	..	3 16 3
665,000	„	„	10	Do. C, D, & E, 10 p.c. Pf.	100	250—255	..	3 18 5
30,000	„	„	5	Do. F, 5 p. c. Prf.	100	123—128	..	3 18 1
60,000	„	„	7½	Do. G, 7½ p. c. do.	100	182—187	..	4 0 4
1,300,000	„	„	7	Do. H, 7 p. c. max.	100	158—163	..	4 5 10
463,000	„	„	10	Do. J, 10 p. c. Prf.	100	248—253	+3	3 19 0
1,061,150	„	14 June	4	Do. 4 p. c. Deb. Stk.	100	118—122	..	3 5 7
294,850	„	„	4½	Do. 4½ p. c. do.	100	125—130	..	3 9 3
650,000	„	„	6	Do. 6 p. c. do.	100	161—172	..	3 9 9
3,800,000	Stck.	15 May	12½	Imperial Continental	100	216—221	+1	5 8 7
75,000	5	14 June	6	Malta & Mediterranean, Ltd	5	5—5½	..	5 9 1
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p.c. Deb.	100	113—115	..	4 6 11
541,920	20	14 June	6	Monte Video, Limited	20	20—21	..	5 14 3
150,000	5	30 May	10	Oriental, Limited	5	8½—9½	..	5 8 1
60,000	5	27 Sept.	7	Ottoman, Limited	5	5½—6½	..	5 12 0
166,870	10	26 July	4	Pará, Limited	10	4½—5½	..	7 5 3
				People's Gas of Chicago—				
420,000	100	2 Nov.	6	1st Mtg. Bds.	100	100-105*	..	5 14 3
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
100,000	10	16 Oct.	10	San Paulo, Limited	10	16—17	..	5 17 8
500,000	Stck.	29 Aug.	16½	South Metropolitan, A Stock	100	300—310	..	5 4 10
1,350,000	„	„	12½	Do. B do.	100	222—227	–1	5 6 10
141,500	„	„	13½	Do. C do.	100	240—250	..	5 6 0
600,000	„	28 June	5	Do. 5 p. c. Deb. Stk.	100	138—142	..	3 10 5
60,000	5	12 Sept.	11½	Tottenham & Edm'ntn, Orig.	5	11—13	..	4 8 5
						*Ex div.		
				WATER COMPANIES.				
717,467	Stck.	14 June	9½	Chelsea, Ordinary	100	268—273	–3	3 7 9
1,720,560	Stck.	16 Oct.	7½	East London, Ordinary	100	213—217	..	3 9 1
544,440	„	28 June	4½	Do. 4½ p. c. Deb. Stk.	100	143—146	..	3 1 7
700,000	50	14 June	9	Grand Junction.	50	127—132	..	3 8 2
708,000	Stck.	29 Aug.	10½	Kent	100	276—281	..	3 14 9
1,043,800	100	28 June	9	Lambeth, 10 p. c. max.	100	255—260	–1½	3 9 3
406,200	100	„	7½	Do. 7½ p. c. max.	100	200—205	..	3 13 2
200,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	118—121	..	3 6 1
500,000	100	14 Aug.	12½	New River, New Shares	100	363—368	+3	3 5 10
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	127—130	..	3 1 6
902,300	Stck.	28 June	6	S'thwk & V'xhall, 10 p.c. max.	100	174—179	..	3 7 0
1,126,500	100	„	6	Do. 7½ p. c. do.	100	168—173	..	3 9 4
155,066	Stck.	14 June	10	West Middlesex	100	267—272	..	3 13 6

† Next dividend, with bonus, will be at this rate.

Extensions at the Brighouse Gas-Works.—The Brighouse Local Board have applied to the Local Government Board for a Provisional Order to obtain borrowing powers for an amount not exceeding £20,000, to extend their gas-works. The works contemplated are a large three-lift holder, 120 feet in diameter, and a retort-house for 120 retorts, &c.

Proposed Electric Lighting Installation at Malvern.—The Local Board of Malvern have been asked to give their support to a proposed electric lighting company to enable them to obtain a Provisional Order. But inasmuch as the Board are about to expend £3000 in increasing the storeage accommodation at the gas-works, certain of the members see grave objections to acceding to the request; and they have arranged to hold a special meeting to discuss the matter.

The Proposed Purchase of the Todmorden Water-Works by the Local Board.—A meeting of the ratepayers of Todmorden was held yesterday week to consider a suggestion by the Local Board that the undertaking of the Water Company should be acquired by the Board. The meeting first had before it an offer of Mr. S. Fielden, a local manufacturer and a shareholder in the Todmorden Water Company, to engage at his own expense a competent engineer to value the undertaking. A long discussion ensued, in which it was stated that the estimated cost of the works to the ratepayers was £60,000. In the end Mr. Fielden's offer was rejected by 320 votes to 269; and it was resolved with practical unanimity that the undertaking should not be purchased at present.

The Nidd Water Scheme of the Bradford Corporation.—We learn that the proposal of the Bradford Corporation to replenish their water supply by drawing water from the River Nidd above Pateley Bridge is causing considerable anxiety to the civic and water-works authorities of York and the inhabitants of Knaresborough. The water supply of the capital city is obtained from the Ouse, of which the Nidd is a tributary; and strenuous efforts are being made by the Corporation to procure such a modification in the proposed scheme as will reduce any evil effects upon the nature of the water, and obviate any difficulty which might arise in respect to the navigation of the Ouse. The water supply of Knaresborough is taken from the Nidd; and as it is contended that the proposals of the Bradford Corporation will draw away the purest water of the river, the local authorities are taking steps in their own defence. A conference of representatives of the York Corporation, the York Water-Works Company, and the Knaresborough Local Board, recently took place at Knaresborough, and certain modifications of the scheme, which may disarm the opposition, but which, on the other hand, may be considered to rob the suggested plan of many of its benefits, were discussed. Should the scheme have a practical solution, it is feared that York will be a great sufferer, as the bulk of the purest water which flows into the Ouse is derived from the Nidd.

The Birkenhead Corporation and Electric Lighting.—At the meeting of the Birkenhead Town Council last Wednesday week, Alderman Deakin, in moving the confirmation of the minutes of the Finance Committee, referred to the resolution passed by the Committee, that the Council should be recommended to authorize the taking of all necessary preliminary steps in connection with the application for a Provisional Order next session for power to supply the electric light in Birkenhead. It was, he said, looked upon as very undesirable that they should admit a strange company into the town to compete as a lighting body with their own Gas Committee. The alternative seemed to be that they should take steps to supply the light themselves. The minutes were confirmed.

Proposed Extension of Bolton.—Like several other Lancashire boroughs and county boroughs, Bolton is seeking to extend its borders. It proposes to include the whole or parts of eleven neighbouring townships and parishes; increasing the area of the county borough from 2361 to 13,224 acres, adding to its population of 112,000 some 26,000 persons, and to its rateable value of £407,086, property of the value of £131,270. An inquiry into the application was recently opened before Major-General C. Phipps Carey and Mr. E. P. Burd, acting under the provisions of the Local Government Act of last session. A long array of Counsel appeared for and against the proposal; the Lancashire County Council and various local bodies offering the scheme strenuous opposition. The Corporation propose to charge the district to be included the same rates for gas and water as prevail in the present borough; but to free the new district from liability on account of the existing debt. Along with this freedom from responsibility will go any claim which the added area may be supposed to have to a share in the profits of the undertakings. This arrangement to continue for twenty years, at the end of which time it is thought the new district will have become so thoroughly identified with Bolton that it will desire to come in on equal terms, and to share in the profits of the Corporation's undertakings. The promoters of the extension scheme allege that the present area of Bolton is smaller than that of any of the forty county boroughs of the kingdom, while as regards population it stands eighteenth on the list. An Extension Bill, the lines of which were similar to the present proposal, was rejected by Parliament in 1877. The Town Clerk (Mr. H. G. Hinnell), in giving evidence, stated that the gas undertaking was acquired in 1872, and the Corporation supplied the borough and outside districts; 32,000 acres being included, with 23 townships. There was a large profit from the gas. The water-works were acquired in 1847; and the area of supply was 55,620 acres, including the whole of the districts proposed to be added and more, and there were five reservoirs. The undertaking was a most profitable one. More exact figures were supplied by the Borough Treasurer (Mr. G. Swainson).

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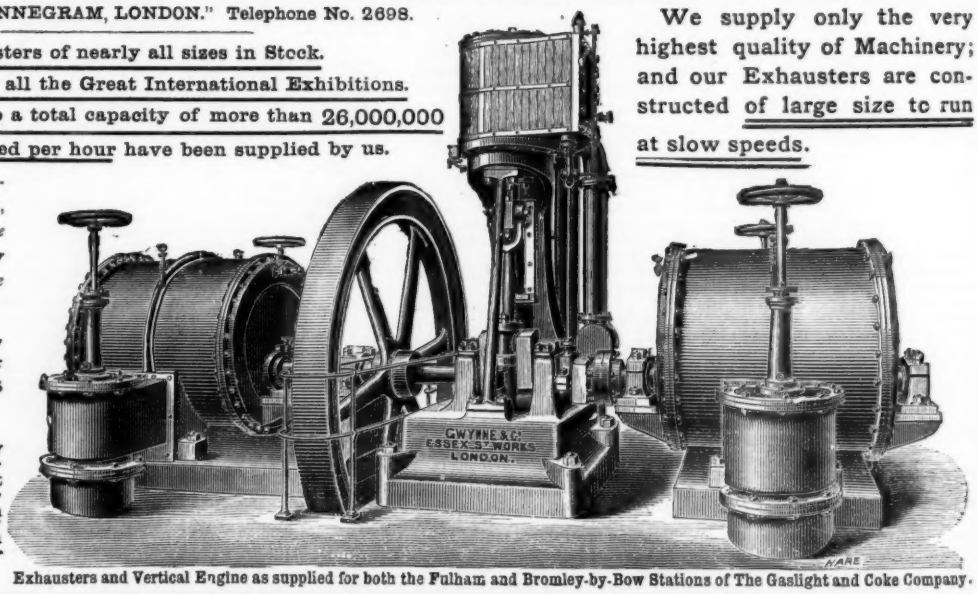

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*** See Advertisement p. 851 of last week's issue.
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Also two 18-inch FOUR-WAY VALVES and Connections.

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£19,167 Perpetual Four Per Cent. Debenture Stock of the West Ham Gas Company, authorized to be raised in pursuance of the "West Ham Gas Act, 1889," and offering to Trustees and others Investments of the soundest character.

MR. ALFRED RICHARDS is favoured with instructions from the Directors of the West Ham Gas Company to submit the above for Sale by Auction at the Mart, Tokenhouse Yard, E.C., on Thursday, Nov. 7, 1889, at One for Two o'clock precisely, in Lots of £100 Stock.

Particulars may be obtained of the SECRETARY to the Company, at the Offices, Union Street, STRATFORD, and of the AUCTIONEER, 8, NEW BROAD STREET, E.C.

RAWMARSH LOCAL BOARD GAS-WORKS.

CONTRACT NO. 4.—TO IRON FOUNDERS AND GASHOLDER MAKERS.

THE Rawmarsh Local Board are prepared to receive TENDERS for the Construction and Erection of a GASHOLDER and the STRUCTURAL IRONWORK of BUILDINGS on the Premises at Parkgate.

The drawings and specifications may be seen at my Office in Rawmarsh, and at the Office of Mr. Thomas Newbigging, C.E., 5, Norfolk Street, Manchester.

Copies of the bill of quantities and form of tender may be obtained from me, the undersigned, or from the said Engineer, on deposit of two guineas, which will be returned on receipt of a *bonâ fide* tender.

Sealed tenders, endorsed "Gasholder and other Ironwork, Contract No. 4," to be addressed to the Chairman of the Gas Committee, and sent so as to reach me not later than Twelve o'clock noon on Monday, the 4th of November next.

The Board do not bind themselves to accept the lowest or any tender.

By order,
J. W. BELLAMY, Clerk.

Local Board Offices, Rawmarsh,
Oct. 22, 1889.

TENDERS FOR TAR.

THE Directors of the Huyton and Roby Gas Company are prepared to receive TENDERS for the surplus TAR made at their Works during the year ending the 31st of October, 1890.

The probable quantity of Tar will be about 120 tons.

Delivery, into Contractors' Tank-Wagons at Huyton Quarry.

Tenders, endorsed "Tar," to be sent in on or before the 9th of November, 1889.

FRED. PRITCHARD,
Secretary and Manager.

LANCASTER CORPORATION.

TENDERS FOR GASHOLDER EXTENSION.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the necessary ALTERATION and ADDITION for converting a 180-feet diameter SINGLE-LIFT GASHOLDER into a Three-Lift, at the Corporation's Gas-Works, St. George's Quay, Lancaster.

Plans may be seen, and copies of specification may be had, on application to the undersigned, on payment of two guineas, which will be returned on receipt of a *bonâ fide* tender.

Sealed tenders, endorsed "Tender for Gasholder Extension," to be sent to Thom. Swainson, Esq., Town Clerk, Lancaster, on or before the 16th prox.

The Committee do not bind themselves to accept the lowest or any tender.

CHARLES ARMITAGE.
Gas-Works, Lancaster, Oct. 15, 1889.

CORPORATION OF LEICESTER.

AYLESTONE ROAD WORKS.

SECTION No. 2.—CONTRACT No. 23.

LANCASHIRE BOILERS.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the Supply and Erection of three LANCASHIRE BOILERS, 26 ft. by 6 ft. 6 in., at their Aylestone Road Works. Foundations will be provided by the Gas Committee.

Specification and form of tender may be obtained upon application to the Engineer, and on payment of the sum of £5, which amount will be returned upon receipt of a *bonâ fide* tender.

Tenders, addressed to Councillor Lennard, Chairman, and endorsed "Tender for Boilers," to be delivered at these Offices not later than Eleven o'clock a.m. on Saturday, the 9th of November prox.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst. C.E.,
Engineer and Manager.

Gas Offices, Millstone Lane, Leicester,
Oct. 23, 1889.

TO INVENTORS AND PATENTEES.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

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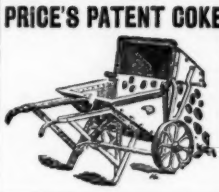
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PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

MARQUIS OF LOTHIAN'S

NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

MR. JOHN MORISON,

NEWBATTLE COLLIERIES,

DALKEITH, N.B.

THOMAS TURTON AND SONS, LIMITED,

Sheaf & Spring Works,

SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

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ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on application.

GAS COAL.

POPE & PEARSON, LTD.,

have now the authority of several of the most eminent Gas Engineers of London in stating that their Coal yields in practical working over 10,000 cubic feet of gas, with an illuminating power of 16 candles; or by the standard burners now used by the London Gas Companies, an illuminating power equal to 17½ candles.

One ton yields 12½ cwt. of good coke.

This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

For further particulars apply to POPE AND PEARSON, LIMITED, West Riding and Silkstone Collieries, near LEEDS.

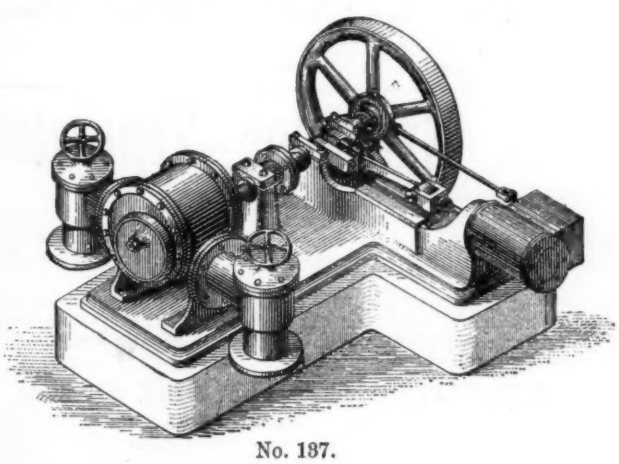
G. WALLER & Co.'s NEW PATENT GAS EXHAUSTER.

MADE WITH 4, 3, OR 2 BLADES.

In use at, or on order for, over 120 *Works, equal to* 6,840,000 *Cubic Feet per Hour.*

Oldest Makers of Beale Exhausters for over 300 Works and 25,600,000 cubic feet per hour

1,000 to 250,000 CUBIC FEET PER HOUR WITH OR WITHOUT ENGINE COMBINED.



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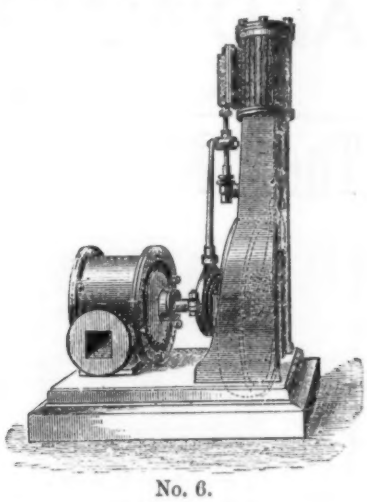

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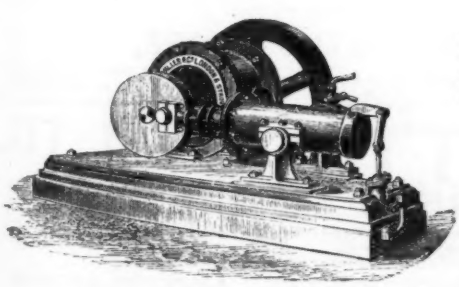


No. 5.

No. 137.—Horizontal Combined Engine and Exhauster.
No. 6.—Vertical ,, for small space.
No. 5.—Oscillating ,, for small works.

BYE-PASS VALVES.

Disc, Rack, and Screw Valves, Compensating Governors (For Steam Throttle Valves),

Tar, Lquor, and Water Pumps, Hydraulic Main Valves, Coke-Breaking Machines.

SEE PREVIOUS ADVERTISEMENTS. ILLUSTRATED CATALOGUE ON APPLICATION.

Phœnix Engineering Works, Park Street, Southwark, London, S.E.,

NEAR SOUTHWARK BRIDGE (FOUR MINUTES FROM HOLLAND STREET), A

STROUD, GLOUCESTERSHIRE.

Newland Gas Coal

For particulars, apply to

LOCKE & CO.,
NORMANTON,
YORKSHIRE.

FIRE-BRICKS. FIRE-CLAY.

JAMES WHITE & CO.,
Albert Oil-Works,
WIDNES, LANCASHIRE.
Sole Proprietors of the Largest and Purest Beds of Fire-Clay in England.

FOR GAS FURNACES OUR GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the market.

GANNISTER and SILICA FIRE-CLAY guaranteed of the Purest and Finest Quality.

ANALYSIS AND REFERENCES ON APPLICATION.

GEO. E. TOURNAY,
Retort-Setter,
Contractor for the Erection of Retort-Ovens, Chimney Shafts, &c.,
THANNINGTON, CANTERBURY.

ANTI-RED LEAD
(SCOLLICK'S PATENT).

This jointing Mastic far supersedes Red and White Lead, and is 30 per cent. chaper. It has been, and is being supplied to The Gaslight and Coke Company's Beckton, St. Pancras, and Kensal Green Stations; and to show that it gives satisfaction, ten orders have been received from Beckton during this year. Amongst other Works it has been supplied to Vauxhall, South Shields, Sheffield, Maidstone, Walton, &c., &c.

Circulars and full particulars on application to the Sole Agents—

S. CHANDLER & SONS,
KENNINGTON OVAL.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

For Prices and complete Analysis, apply to

YOUNG, DANCE, & CO.
COAL OWNERS, NEWCASTLE-ON-TYNE,
Or E. FOSTER & CO., 21, John St., Adelphi, LONDON, W.C.

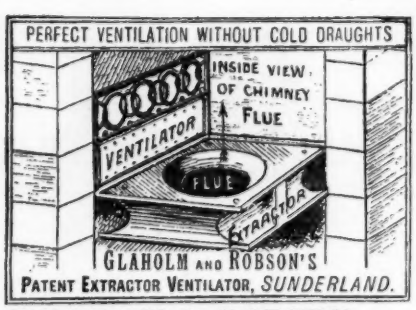
JOHN BROWN & CO., LIMITED,
ATLAS STEEL AND IRON WORKS, SHEFFIELD,

ALDWARKE MAIN GAS COAL.

This Coal yields 12,600 feet of 16-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

The "M.P." Noiseless Flue Extractor Ventilator

(ROBSON'S PATENT)



Draws Foul Air from the Top of a Room into the Chimney in a constant stream Acts with or without Fire Heat. Can be fixed in existing Flues at trifling cost; and is the only Ventilator which accelerates the current of Vitiated Air into the Chimney.

Mr. J. H. COX, Jun., of the Sunderland Gas-Works, writes: "I have tried many and careful experiments with your Ventilator, and find there is always a current of air passing into the chimney, varying, according to the weather, from 20 to 60 cubic feet per minute I may say your principle is a sound one."

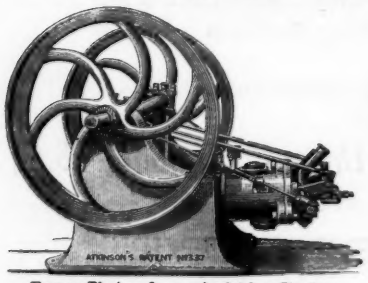
THE "M.P." GLOBE CHIMNEY COWL

Is a perfect cure for Smoky Chimneys. Has a free unimpeded Outlet, prevents down draught, and improves sluggish chimneys by improved up current. Troublesome smoky chimneys cured and Ventilation perfected by combining the Extractor Ventilator with the Globe Chimney Cowl.

GLAHOLM & ROBSON,
Sunderland (Manufacturers).

F. AUGUSTUS MOORE,
25, Bedford Row, London, W.C., Agent.

MANLOVE, ALLIOTT, & CO., LTD.,
ENGINEERS,
NOTTINGHAM,
LONDON, MANCHESTER, AND GLASGOW.



From a Photo. of a nominal 6-h.p. Engine.

ATKINSON'S "CYCLE" PATENT
GAS-ENGINE.

The simplest and most economical Gas-Engine made.
THE BEST ENGINE FOR ELECTRIC LIGHT.
Consumes less Gas per brake horse power than any other Gas-Engine

TELEGRAPHIC ADDRESS: "MANLOVES NOTTINGHAM."

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND DISTRICT OFFICE: 22, TEMPLE STREET, BIRMINGHAM—AGENT: A. C. SCRIVENER.

TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

A SPECIAL COMPOUND

FOR THE CURE OF STOPPED ASCENSION-PIPES,

A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.

PRICE AND PARTICULARS ON APPLICATION.

Head Office: CORPORATION STREET, BIRMINGHAM.

CAST-IRON PIPES, ETC.

THOMAS SPITTLE, LTD.

[ESTABLISHED OVER 50 YEARS.]

CAMBRIAN FOUNDRY, NEWPORT, MON.,

MAKERS OF

CAST-IRON PIPES FOR GAS, WATER, AND STEAM.

ALSO

Retorts, Mouthpieces, Lamp-Posts, Hydraulic Mains, H-Pipes, Dip-Pipes, Buckstaves, Ash-pans, Sight-Holes, Syphons, Ascension-Pipes, Fire Doors and Frames, Fire-Bars, Hydrants, Valves, Purifiers, Tanks, Columns, &c., &c.

ALSO ALL WROUGHT-IRON WORK.

THE LARGEST MAKERS IN WALES.

ESTABLISHED 1825.

GAS TUBES

MANUFACTURERS OF EVERY DESCRIPTION OF

IRON OR STEEL LAP-WELDED OR BUTT-WELDED TUBES

FOR ANY PURPOSE.

SPECIALITIES.

THE "NUGENT" RECUPERATIVE RETORT SETTINGS and FURNACES.

"ROBUS" IMPROVED RETORT SETTINGS, with COKE, TAR, and BREEZE FURNACES.

THE ABOVE SETTINGS & FURNACES ARE PROVING EMINENTLY SATISFACTORY.

Every Particular, with Estimates, forwarded upon Application to

MESSRS. J. & H. ROBUS,

CONTRACTORS FOR THE ERECTION OF GAS & WATER WORKS,

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SPENT LIMES NO LONGER WASTE PRODUCTS!

G. R. HISLOP'S PATENT REGENERATIVE PROCESS

MOST EFFECTIVELY AND *ECONOMICALLY RESTORES* LIME WASTES CONTINUOUSLY.

The Patentee having under his several Patents effected a complete solution of the Spent Lime difficulty, most confidently solicits the consideration of the fact by the Engineers and Managers of Gas Companies, Gas Corporations, and other Spent Lime producers. The adoption of these Patents secures the following amongst other advantages, viz.:—1st. Nuisance is avoided, and the utmost convenience and comfort in Gas purification are secured. 2nd. The Lime is recovered at from one-third to one-half the cost of new Lime, or from 5s. 6d. to 7s. 6d. per Ton (depending on extent of works and working charges). 3rd. The Lime is either recovered for Building and Agricultural purposes, or specially and continuously for Gas purification—no limit being assigned to its durability. 4th. Nearly the whole of the valuable sulphur is collected and sold. 5th. By the Patentee's Improved Furnace, breeze or inferior cannel coke only is required as a fuel. The process has been worked for a considerable time by several important Gas Companies and Corporations throughout the Kingdom, and with the most satisfactory results. The Patentee erects, proves, and grants working on very moderate terms.

Further particulars may be had on application to A. F. Wilson, Esq., Assoc. M. Inst. C.E., 12, Walbrook, London, E.C., Agent for London; J. E. Fisher, Esq., Stourbridge, Agent for the rest of England, Wales, and Ireland; or to the Patentee—

GEO. R. HISLOP, Engineer, GAS-WORKS, PAISLEY, N.B.

BRECKENRIDGE CANNEL,

OF KENTUCKY, U.S.A.

The undersigned, SOLE AGENTS for this celebrated Gas Cannel, now offer it for delivery at any port in

GREAT BRITAIN,
ON THE CONTINENT,
OR SOUTH AMERICA.

This Cannel ranks with the Australian Shale as an enricher of Coal Gas; One Gross Ton producing

15,000 Cubic Feet of 50-Candle Gas, & 26 Bushels of superior Marketable Coke.

FOR PRICES AND FURTHER PARTICULARS, APPLY TO

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JOHN BROTHERTON, LIMITED,

IMPERIAL TUBE WORKS,

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Paris Exhibition 1867.
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Silver Medal and First-Class Certificate
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First Order of Merit and Medal.

MANUFACTURERS OF
WELDED IRON TUBES AND FITTINGS
FOR GAS, STEAM, WATER, &c.
LAP-WELDED TUBES
FOR LOCOMOTIVE, MARINE, AND STATIONARY BOILERS, AND OTHER PURPOSES.
HYDRAULIC AND HOT-WATER TUBES.
COILS OF ALL SIZES AND SHAPES.
Stocks, Taps, Dies, Taper Telegraph Poles, &c., &c.

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SIXTY PER CENT. ECONOMY IN GAS LIGHTING.

The Schülke Regenerative Lamp

FOR
DOMESTIC AND EXTERNAL LIGHTING.

The only Regenerative Lamp employing the Common Flat-Flame Burners.

Lamps giving 20-Candle power consume less than four feet of Gas per hour.

A PURE WHITE & PERFECTLY STEADY LIGHT,
NOT AFFECTED BY DRAUGHTS.

Suitable for any existing fittings (Brackets or Suspending).
Can be fixed in a few minutes.

May be seen at the Offices of the

SCHÜLKE GAS-LAMP Co.
LIMITED,
Room 446—11, QUEEN VICTORIA STREET,
LONDON, E.C.,
Where Price Lists and full particulars may be obtained.

WATER GAS FUEL GAS

FOR INDUSTRIAL PURPOSES

GENERATED FROM

BITUMINOUS SLACK COAL

BY THE

LOOMIS PROCESS.

The Cheapest Gas-Generating System in the World.

NOVEL IN DESIGN.
MODERN IN CONSTRUCTION.
SIMPLE IN OPERATION.
PERFECT IN RESULTS.

PROCESS AND APPARATUS PATENTED IN ALL COUNTRIES.

By this system more gas, and of a higher heating power per cubic foot, can be generated from a ton of Bituminous Slack Coal than by any other from a ton of Anthracite Coal or Coke.

The successful application of Water Gas for industrial purposes was brought about through this Process at the Works of the—

JOHN RUSSELL CUTLERY COMPANY, Turner's Falls, Mass., where it has been in daily use upwards of two years, doing all the Forging, Hardening, and Tempering.
HENRY DISSTON & SONS, Steel, Saw, and File Works, Philadelphia.
AMERICAN WALTHAM WATCH COMPANY, Waltham, Mass.
ADDYSTON PIPE AND STEEL COMPANY, Cincinnati.

Many other industrial establishments in America are successfully using this Process, and a large number of Works are now being erected including a plant at Brussels and at Sheffield (at Messrs. Thomas Firth and Sons, Limited).

This process is especially adapted for firing all classes of Pottery, Tile, and Brick Kilns.

For particulars apply to

NEWTON, CHAMBERS, & CO., LIMITED,

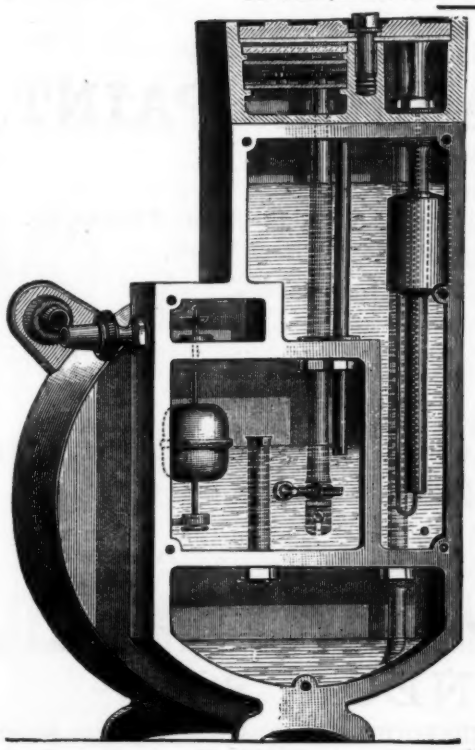
THORNCLIFFE IRON-WORKS, near SHEFFIELD.

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.



Sole Makers of Green's Patent Underground Wet Gas-Meters for Street Lighting, &c., and Ogden's Patent Spindle Tube for Wet Gas-Meters.

GREEN'S PATENT
UNDERGROUND METER

Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost. No box is required, and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s., and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6½ inches by 8½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid, which does not injure the fittings; and this can be supplied at about 1s. per gallon.

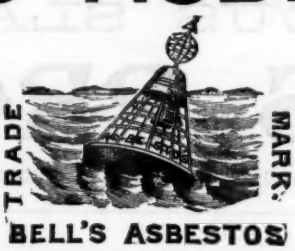
Prices and all Information on Application.

GRANGE WORKS, EDINBURGH.

HIGHEST AWARDS given for our WET and DRY METERS at

Exhibitions held at GLASGOW, CALCUTTA, and EDINBURGH.

BELL'S ASBESTOS AQUOL PAINT



IS MADE READY FOR USE.

IS FIRE RESISTING.
IS WASHABLE.
IS NON-POISONOUS.
IS MANUFACTURED IN ALL USEFUL COLOURS.
IS IMPERVIOUS TO HEAT, COLD, OR WATER.
IS WITHOUT SMELL.

No expensive Oil or Turpentine required.

WILL NEVER BLISTER.

HAS A COVERING CAPACITY **40** PER CENT. GREATER THAN LEAD PAINTS.

For Outside or Inside Work in any Climate.

Bell's Asbestos Aquol Paint is equally suitable for the finest decorative work as well as for general painting. It can be applied over or under any other paint, and, owing to its easy application, can be used with a large distemper brush; the SAVING THUS EFFECTED IN LABOUR BEING **50** PER CENT. OVER THAT OF LEAD PAINTS.

Bell's Asbestos Aquol Paint is susceptible of the most delicate treatment; and, owing to its perfect flatted surface, it brings up the varnish in a manner that no other paint can equal. ONE COAT OF VARNISH ON **Bell's Asbestos Aquol** IS EQUAL TO TWO COATS ON ORDINARY PAINT.

BELL'S ASBESTOS AQUOL PAINT is specially adapted for Private Houses, Exhibition Buildings, Ships, Churches, Asylums, School Boards, Railway Stations, and all work of Wood, Iron, Cement, Plaster, Stone, Brick, &c., &c.

Those who Study Economy and Protection from Fire should use only

BELL'S ASBESTOS AQUOL PAINT.

BELL'S ASBESTOS AQUOL PRIMING is made Ready for Use.
BELL'S ASBESTOS AQUOL PRIMING stops all suction of Wood, Cement, Plaster, &c.
BELL'S ASBESTOS AQUOL PRIMING should be applied to all New Work.

Suitable for Ceilings, Walls, and New Wood, and is very durable.

BELL'S ASBESTOS AQUOL KNOTTING, for Stopping Knots in New Work.

AN EXCELLENT CURE FOR DAMP WALLS.

Colour Cards and Price Lists on Application.

Supplied in Casks of 5 to 7 cwt., and Iron Drums of 28, 56, and 112 lbs., Sample Tins of 7 and 14 lbs.

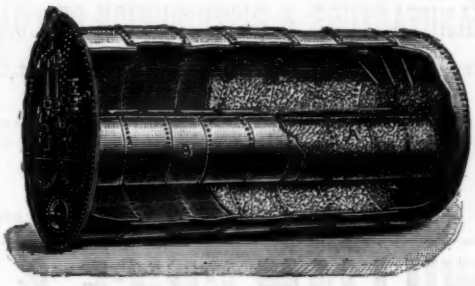
Owing to its Covering Capacity, a SAVING IN FREIGHT of 40 per cent. is effected for a given surface.

BELL'S ASBESTOS COMPANY, LIMITED,
SOUTHWARK, LONDON, S.E.

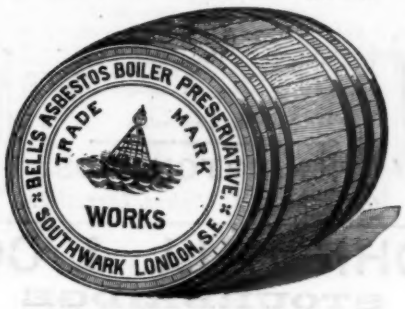
DEPOTS—MANCHESTER: Cable Street, Blackfriars. LIVERPOOL: 2, Strand Street, James Street.
CARDIFF: West Bute Street. BIRMINGHAM: 7, John Bright Street. HULL: Humber Dock Basin.
GLASGOW: 35, Robertson Street. DUBLIN: 2, St. Andrew Street. BERLIN and BARCELONA.

BELL'S ASBESTOS BOILER PRESERVATIVE

Will remove Incrustation from Steam-Boilers of all kinds without chipping.



A shows Boiler Plates when incrusted.
B shows Boiler Plates when cleaned by this Composition.



Every Cask is sent out as above.

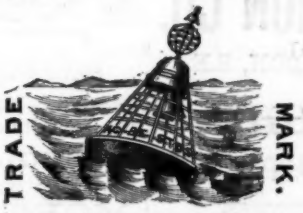
The action of this **BOILER PRESERVATIVE,** by absorbing the free oxygen that is in the water, **entirely checks pitting and corrosion.** It also disintegrates incrustation so immediately as to prevent its adhering to the plates; and the deposit falls to the bottom in a loose powder, which is easily swept out. By keeping boilers clean, a **great economy of fuel is effected,** and the danger of the plates burning is entirely obviated; thus avoiding the great risks which are inseparable from scaled plates, lengthening the life of a boiler, and **covering its own cost a hundredfold.** Whenever possible it should be used through Feed Pump or Injector, which it will also keep clear from incrustation. The small quantity required to effect its purpose makes this the most economical, and more than repays the higher price we charge for a fluid which, in the case of many other makers, is useless.

QUANTITY REQUIRED—A quarter of a pint weekly per horse power indicated; where the water is very bad rather more, or one pint for every 700 gallons of water evaporated.

BELL'S ASBESTOS CO., Ld.

DEPÔTS.

MANCHESTER: Cable St., Blackfriars.
LIVERPOOL: 2, Strand St., James St.
HULL: Humber Dock Basin.
DUBLIN, BERLIN.



DEPÔTS.

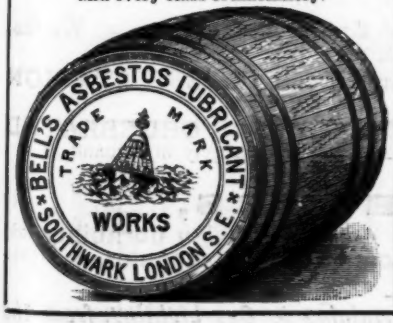
BIRMINGHAM: 7, John Bright Street.
GLASGOW: 35, Robertson Street.
CARDIFF: West Bute Street.
And BARCELONA.

SOUTHWARK, BELL'S ASBESTOS. **LONDON, S.E.**

BELLS ASBESTOS
YARN AND SOAPSTONE PACKING
Is the BEST LOCOMOTIVE PACKING made.

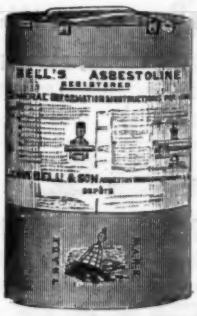
BELL'S
COMPOUND HYDRAULIC PACKING
Is specially suited for Hydraulic Machinery, Accumulators, and Ammonia and all Pumps.

BELL'S ASBESTOS LUBRICANT
Is unequalled
For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.



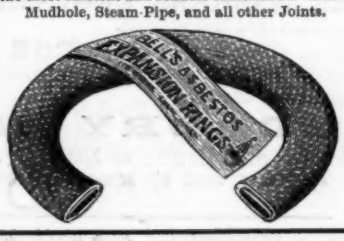
BELL'S ASBESTOLINE
The reputation of this Lubricant is based on the experience of thousands of users, which places it far in advance of those who rely only on mere laboratory tests.

ASBESTOLINE IS THE CHEAPEST MOST EFFICIENT, CLEANEST MOST INODOROUS AND SAFEST LUBRICANT.

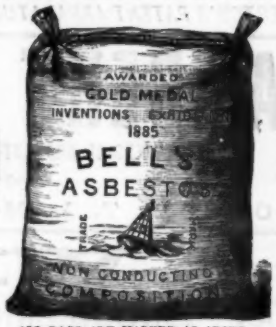


ASBESTOLINE HAS SAVED 90 PER CENT. OVER OIL. Has been used for all purposes, AND BEATEN ALL OTHER LUBRICANTS IN ACTUAL WORK.

BELL'S ASBESTOS
EXPANSION SHEETING
RINGS, AND TAPE.
Is the most efficient and reliable Material for Manhole, Mudhole, Steam-Pipe, and all other Joints.



BELL'S ASBESTOS
NON-CONDUCTING COMPOSITION.
Will reduce loss by radiation, and saves 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



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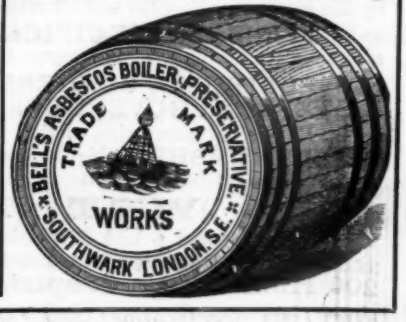

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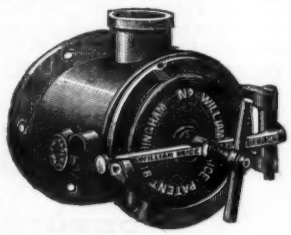

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[See also Advt., p. 866.

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